10-3930-615-15

TM 10-3930-615-15

TECHNICAL MANUAL

OPERATOR, ORGANIZATIONAL, DIRECT SUPPORT, GENERAL SUPPORT AND DEPOT MAINTENANCE MANUAL

TRUCK, FORK LIFT, ELECTRIC, SOLID RUBBER TIRES, 4,000 LB CAPACITY

BAKER MODEL FTD-040-EE, ARMY MODEL MHE 208)

FSN 3930-494-8151
(100 IN. LIFT) FSN 3930-236-6253 (180 IN. LIFT)

> This copy is a reprint which includes current pages from Changes 1 and 2.

HEADQUARTERS, DEPARTMENT OF THE ARMY

FEBRUARY 1970

D 101.11:

READEX FICHE best copy available

SAFETY PRECAUTIONS

BEFORE OPERATION

When servicing battery, do not smoke or use flame in vicinity. Batteries generate hydrogen, a highly explosive gas.

Avoid contact with the battery electrolyte. If the solution comes in contact with the skin, rinse the area immediately with clean water to avoid skin burns.

Check equipment logbook for record of proper servicing and maintenance.

Cneck the operating area to be sure it is clear of personnel and obstructions.

DURING OPERATION

Be alert for other workers to be sure they are not in the way of the load or the moving truck.

Be sure there is sufficient clearance overhead and on each side of the truck.

Always travel with the mast tilted back and with forks raised just high enough to clear any uneven floor conditions.

Avoid sudden starting and stopping of the truck. Reduce speed when making a turn.

Face in the direction of travel.

Know the rated capacity of the truck and do not overload it. Never pick up a load until certain it can be carried safely.

Make sure the load is steady before lifting it and keep the load against the carriage backrest.

When transporting bulky loads, travel in reverse. Always descend ramps in reverse when carrying a load.

When unloading a heavy elevated load, position the load directly over the unloading spot, as low as possible, before tilting the mast forward.

Be very careful when high-tiering.

Do not butt loads with the forks or with the rear of the truck.

Report any evidence of faulty truck performance.

AFTER OPERATIONS

Make sure forks are lowered to the ground and handbrake is engaged firmly.

If truck is parked on an incline, block at least two wheels in the event of handbrake failure.

Changes in force: C 1, and C 2

TM 10-3930-615-15
C2

CHANGE }
No. 2 }

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, *7 February 1980*

Operator Organizational, Direct Support, General Support, and Depot Maintenance Manual

TRUCK, FORK, LIFT, ELECTRIC; SOLID RUBBER TIRES; 4000 LB. CAPACITY, (BAKER MODEL FTD-040-EE, ARMY MODEL MHE-208) (NSN 3930-00-494-8151), 100-IN LIFT; (NSN 3930-00-236-6253, 180-IN LIFT).

TM 10-3930-615-15, 3 February 1970, is changed as follow:

Page 5-1. after paragraph 5-4. Add the following:

WARNING

Insure that static electricity discharge straps are installed on the forklift truck and are in good condition. Failure to use the straps could result in the generation of a spark which could ignite explosives or flammables.

By Order of the Secretary of the Army:

E. C. MEYER
General, United States Army
Chief of Staff

Official:

J. C. PENNINGTON
Major General, United States Army
The Adjutant General

Distribution:
To be distributed in accordance with DA Form 12-25A, Organizational maintenance requirements for Warehouse Equipment.

TM 10-3930-615-15
C 1

CHANGE No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *16 May 1972*

Operator, Organizational, Direct and General Support, and Depot Maintenance Manual

TRUCK, LIFT, FORK; ELECTRIC; SOLID RUBBER TIRES; 4,000 LB. CAPACITY (BAKER MODEL FTD-040-EE, ARMY MODEL MHE-208) FSN 3930-494-8151, 100-IN LIFT; FSN 3930-236-6253, 180-IN LIFT

TM 10-3930-615-15, 3 February 1970, is changed as follows:

Page B-1. Appendix B is superseded as follows:

APPENDIX B

BASIC ISSUE ITEMS LIST AND ITEMS TROOP INSTALLED OR AUTHORIZED

Section 1. INTRODUCTION

B-1. Scope

This appendix lists items required by the operator for operation of the truck.

B-2. General

This list is divided into the following sections:

a. Basic Issue Items List—Section II. Not applicable.

b. Items Troop Installed or Authorized List—Section III. A list of items in alphabetical sequence, which at the discretion of the unit commander may accompany the truck. These items are NOT SUBJECT TO TURN-IN with the truck when evacuated.

B-3. Explanation of Columns

The following provides an explanation of columns in the tabular list of Basic Issue Items List, Section II and Items Troop Installed or Authorized, Section III.

a. Source, Maintenance, and Recoverability Code(s) (SMR):

(1) *Source code,* indicates the source for the listed item. Source codes are:

Code	*Explanation*
P	Repair parts, special tools and test equipment supplied from GSA/DSA or Army supply system and authorized for use at indicated maintenance levels.
P2	Repair parts, special tools and test equipment which are procured and stocked for insurance purposes because the combat or military essentiality of the end item dictates that a minimum quantity be available in the supply system.

(2) *Maintenance code,* indicates the lowest level of maintenance authorized to install the listed item. The maintenance level code is:

Code	*Explanation*
C	Crew/Operator

(3) *Recoverability code,* indicates whether unserviceable items should be returned for recovery or salvage. Items not coded are nonrecoverable. Recoverability codes are:

Code	*Explanation*
R	Applied to repair parts (assemblies and components), special tools and test equipment which are considered economically reparable at direct and general support maintenance levels.
S	Repair parts, special tools, test equipment and assemblies which are economically reparable at DSU and GSU activities and which normally are furnished by supply on an exchange basis.

b. Federal Stock Number. This column indicates the Federal stock number assigned to the item and will be used for requisitioning purposes.

c. Description. This column indicates the Federal item name and any additional description of the item required.

d. Unit of Measure (U/M). A 2 character alphabetic abbreviation indicating the amount or quantity of the item upon which the allowances are based, e.g., ft, ea, pr, etc.

e. Quantity Furnished with Equipment (BIIL). (Not applicable).

f. Quantity Authorized (Items Troop Installed or Authorized). This column indicates the quantity of the item authorized to be used with the equipment.

Section III. ITEMS TROOP INSTALLED OR AUTHORIZED LIST

(1) SMR Code	(2) Federal stock number	(3) Description		(4) Unit of meas	(5) Qty Auth
		Ref No. & Mfr code	Usable on code		
	7510-889-3494	BINDER, Looseleaf		EA	1
	7520-559-9618	CASE, Maintenance and Operation Manuals		EA	1
	4210-889-2222	EXTINGUISHER, Fire		EA	1

By Order of the Secretary of the Army:

W. C. WESTMORELAND,
General, United States Army,
Chief of Staff.

Official:

VERNE L. BOWERS,
Major General, United States Army,
The Adjutant General.

Distribution:

To be distributed in accordance with DA Form 12-25A, (qty rqr block No. 894) Organizational Maintenance requirements for Warehouse Equipment.

TM 10-3930-615-15

TECHNICAL MANUAL

HEADQUARTERS

DEPARTMENT OF THE ARMY

NO. 10-3930-615-15

WASHINGTON, D.C., 3 February 1970

OPERATOR, ORGANIZATIONAL, DIRECT SUPPORT, GENERAL SUPPORT AND DEPOT MAINTENANCE MANUAL

TRUCK, FORK LIFT, ELECTRIC, SOLID RUBBER TIRES, 4,000 LB CAPACITY

(BAKER MODEL FTD-040-EE, ARMY MODEL MHE 208)

FSN 3930-494-8151

(100 IN. LIFT) FSN 3930-236-6253 (180 IN. LIFT)

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SECTION 1

GENERAL DESCRIPTION

1-1. INTRODUCTION.

1-2. This manual contains general service, operating and maintenance instructions for Truck, Fork Lift, Electric, Solid Rubber Tires, 4,000-Pound Capacity, Baker Model FTD-040-EE.

1-3. DESCRIPTION.

1-4. The electric fork lift truck has a safe load capacity of 4,000-pounds, and is primarily designed for warehouse operation to load, transport, unload and stack loads, at a load center of 24-inches. The truck is equipped with either a load lift of 100-inches of 180-inches. The fork lift truck is illustrated in figures 1-1 and 1-2.

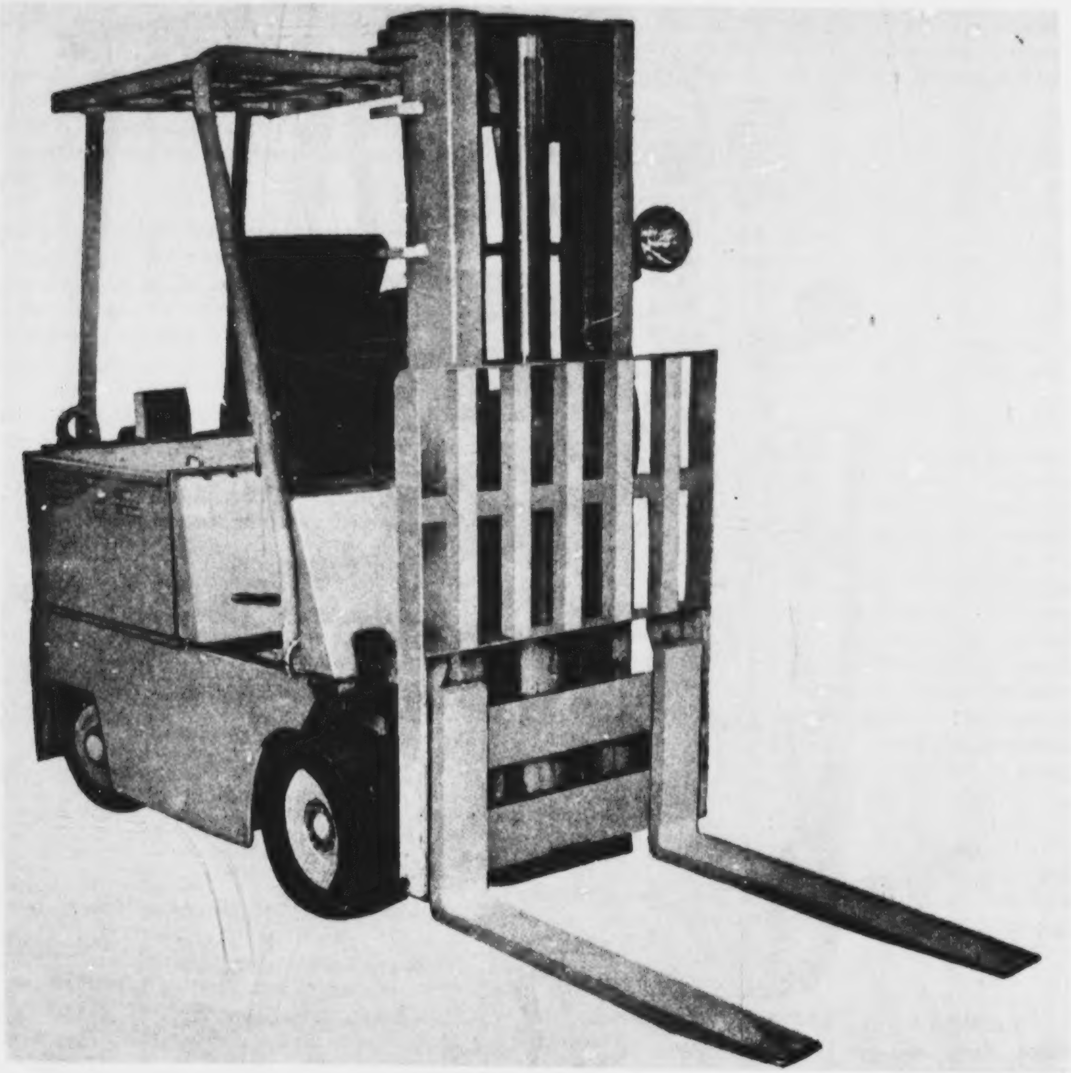


Figure 1-1. Truck, Three Quarter Front View

1-5. **TRUCK.** Power for travel and lifting is provided by a 36-volt battery. The travel system includes the motor, all operating controls, and power axle assembly to provide stepless speeds forward and reverse. The lifting system includes an electric motor, pump, controls, reservoir, lift and tilt cylinders, mast assembly and forks. Hydraulic service brakes and both hand and automatic parking brakes are used.

1-6. **POWER AXLE AND MOTOR ASSEMBLY.** The power train consists of the travel motor, coupling, power axle with differential, axle shafts, and drive wheels. Power is transmitted direct from the travel motor through an adapter incorporating reduction gearing to a bevel ring gear and pinion in the axle, through the axle drive shafts and wheels.

1-7. **CONTROL SYSTEM.** Travel motor power and vehicle speed and direction are regulated by a system which includes relays, an electronic silicon controlled rectifier (SCR) control system, an accelerating master switch and directional switch providing stepless forward or reverse speeds. A foot accelerator operates the accelerating master switch to control the speed of the truck. Steering System. The steering system includes power steering gear of the rotary valve type in which a recirculating ball nut functions

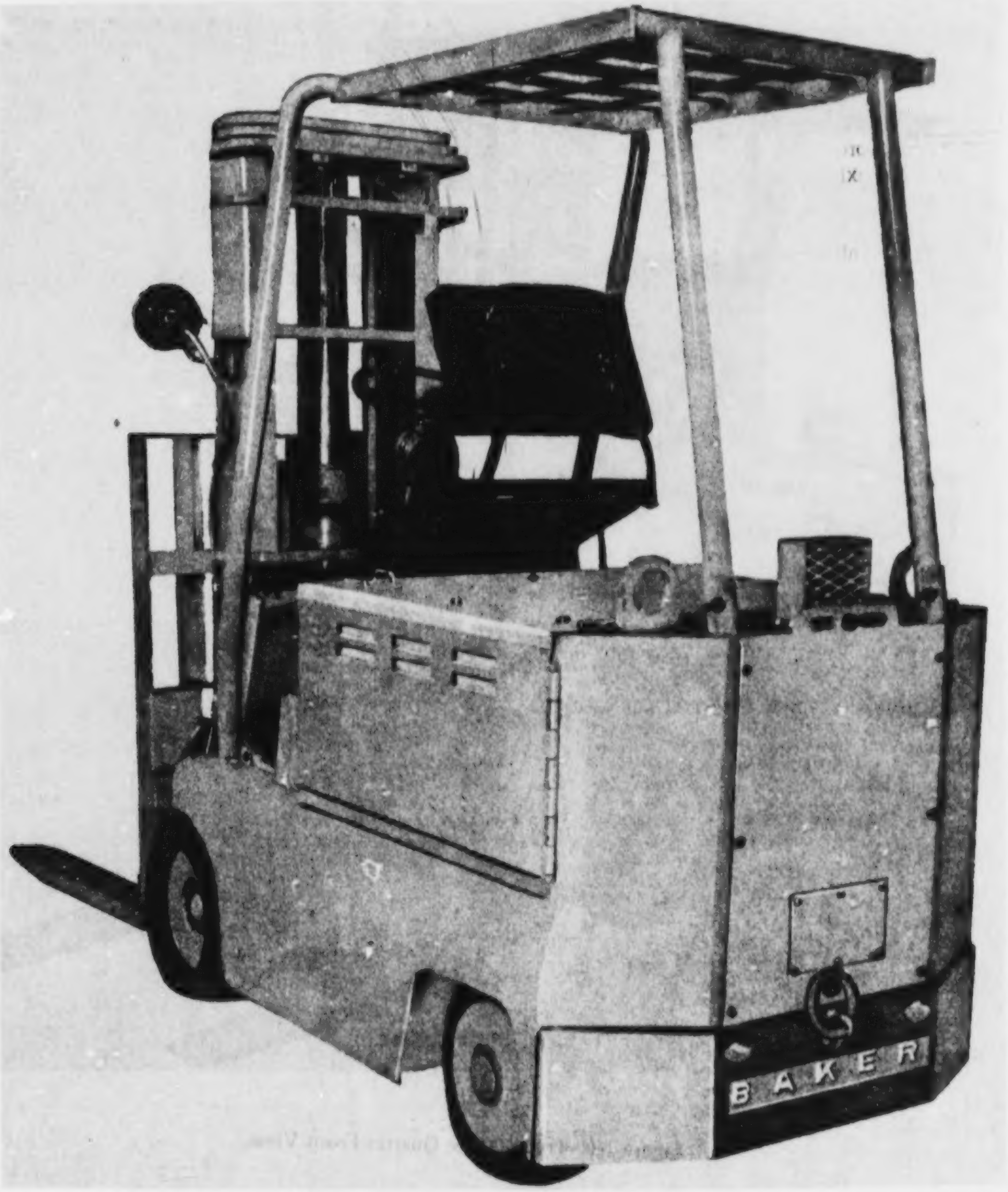


Figure 1-2. Truck, Three Quarter Rear View

as a nut within the gear housing. A double acting valve responds to turns of the steering wheel to apply turning power to the steering bellcrank, tie rods and steering knuckles on the trailing axle as in conventional manual steering.

1-8. BRAKE SYSTEM. The brake system consists of a mechanical parking brake and a hydraulic foot brake. The mechanical brake operates on a drum on the travel motor armature shaft. This brake is applied either by a handle on the floor to the right of the driver or automatically through spring action as the driver rises from the seat. The hydraulic brake system is a conventional automotive type, effective only on the front wheels.

1-9. DUAL LIST MAST ASSEMBLY. The dual lift mast assembly consists of the following assemblies:

1. Outer Upright Assembly. The outer upright assembly serves as a guide for the inner upright assembly, a base for the hoist cylinder, and provides brackets for connecting the uprights to the power axle and for connecting the upright to the tilt cylinders.

2. Inner Upright Assembly. The inner upright assembly is nested in and guided by the outer upright assembly. The hoist cylinder, mounted in the base of the outer upright assembly, is secured to the inner upright assembly. The inner upright assembly is raised or lowered by action of the hoist cylinder.

3. Crosshead Assembly. The crosshead assembly is mounted over the hoist cylinder. Chains are reeved over rollers attached to the crosshead assembly. The lower ends of the chains are connected to the lift carriage. The upper ends of the chains are anchored to the lift cylinder. As the plunger of the hydraulic cylinder raises the crosshead, tension is applied to the chains, raising the carriage.

4. Lift Carriage Assembly. The lift carriage assembly rides on rollers within the inner upright assembly, which in turn slides up and down inside the outer upright assembly to a lift height of 100 inches.

1-10. TRIPLE LIFT MAST ASSEMBLY. The optional triple lift mast assembly consists of the following assemblies:

1. Outer Upright Assembly. The outer upright assembly is a welded one-piece assembly that is mounted on the truck frame assembly and encloses the hoist cylinder, intermediate upright assembly and inner upright assembly.

2. Inner Upright Assembly. The inner upright assembly is a welded one-piece assembly that is mounted within the intermediate upright assembly. The hoist cylinder, mounted at the base of the assembly, is secured to the top of the assembly. The inner upright assembly is raised or lowered by action of the hoist cylinder.

3. Intermediate Upright Assembly. The intermediate upright assembly is positioned between the inner and outer upright assemblies, and provides additional mast rigidity and an overall truck profile height of 83 inches while permitting a lift height of 180 inches. As the plunger of the hydraulic cylinder raises the inner upright assembly, tension is applied to chains attached between a cross member attached at the top and reeved around rollers on the intermediate upright assembly to anchors at the top of the outer upright assembly to separate the inner and intermediate assemblies from the outer upright assembly.

4. Lift Carriage Assembly. The lift carriage rides on rollers within the inner upright assembly. Two forks are mounted on the front of the lift carriage assembly for handling of loads.

1-11. HYDRAULIC SYSTEM. The hydraulic system consists of a reservoir, pump control valve, hoist and tilt cylinder, and hydraulic hoses. The hoist cylinder raises the lift carriage and forks by hydraulic pressure supplied by the pump. Gravity lowers the lift carriage.

1-12. LIFT CYLINDER. A compound lift is used on this vehicle. The lift carriage rises to the top of the outer upright before the inner and/or intermediate uprights together with the lift carriage move upward. This is achieved by a dual hydraulic hoist cylinder assembly with two pistons working in sequence.

1-13. TILT CYLINDERS. The tilt cylinders are double-acting. The uprights are tilted in and out by hydraulic pressure to the tilt cylinders.

1-14. ELECTRICAL SYSTEM. The electrical system is a two-wire, undergrounded type. The battery is connected into the circuit by means of a removable connector. The charging connection is also made through this connector. The weight of the operator in the drivers seat closes the circuit to the accelerating switch by an interlock. Travel control is through the accelerating switch, with circuit made and broken by relays. A panic switch mounted on the dash panel opens and closes the travel circuit. The direction of travel is selected by the directional switch lever on the steering gear post. The stop and taillight is enclosed in a guard on the rear of the truck. The headlight, mounted on the left side of the hoist upright, is controlled by a toggle switch on the instrument housing.

1-15. BATTERY. The 36-volt battery used will weigh approximately 1600 pounds. The inside of the truck battery compartment is 26-13/16 inches long, 32-7/8 inches wide, and 23-3/8 inches high.

1-16. ACCELERATOR MASTER ASSEMBLY. The accelerator master assembly contains three sensitive switches, operated in sequence by cams. The cams are actuated by the accelerator pedal. The switches energize relays which through the SCR control system govern the speed of the travel motor. A potentiometer governs signal strength and thereby power output of the SCR travel motor control circuit. The accelerating switch is located under the floor plate.

1-17. LEADING PARTICULARS.

1-18. The leading characteristics of the electric fork lift truck are as follows:

Aisle width (minimum) (carrying 48 in. cube):	
Intersecting	69-5/8 in.
Right angle stacking	137-5/8 in.
Gradeability (maximum load)	15%
Hoist speed (empty)	
Dual Mast Assembly Truck	61 ft/minute
Triple Mast Assembly Truck	56 ft/minute
Hoist speed (maximum load)	
Dual Mast Assembly Truck	40 ft/minute
Triple Mast Assembly Truck	33 ft/minute
Lift height	
Dual Mast Assembly Truck	100 in.
Triple Mast Assembly Truck	180 in.
Load capacity (maximum)	4,000 lb.
Maximum speed (empty):	
Forward	5.8 mph
Reverse	5.7 mph
Maximum speed (loaded):	
Forward	5.6 mph
Reverse	5.5 mph
Tilt limitation:	
Backward	10 Deg
Forward	3 Deg
Turning radius (no load):	
Inside	6-7/8 in.
Outside	69-5/8 in.
Steering gear ratio	17.5:1

Steering wheel travel	
Left hand (2.061 turns of steering wheel)	42 deg 20 min
Right hand (2.061 turns of steering wheel)	42 deg 20 min
Battery	
Voltage	36 v
Type	Lead acid or nickel-iron
Weight	
Lead Acid (FSN 6140-900-6285)	2200 lbs
Nickle Iron (FSN 6140-901-1054)	1645 lbs
Tires	
Type	Solid rubber
Number:	
Drive	2
Steer	2
Size	
Drive	18 x 8 x 12-1/8 in.
Steer	16 x 5 x 10-1/2 in.
Over-all dimensions and weight	
Ground clearance (at mast center)	3 in.
Height (Over-all):	
With dual mast assembly retracted	83 in.
With dual mast assembly extended	119-1/2 in.
With triple mast assembly retracted	83 in.
With triple mast assembly extended	199-1/2 in.
Length:	
Over-all	125-1/2 in.
Forks	40 in.
Weight w/battery (dual mast assembly truck)	9,170 lbs
Weight w/battery (triple mast assembly truck)	9,080 lbs
Weight w/o battery (dual mast assembly truck)	6,885 lbs

Weight w/o battery (triple mast assembly truck) . 7,453 lbs

Width . . . . 42 in.

Wheel load (dual mast assembly truck)

Drive . . . . 3.430 lbs

Steer . . . . 5,740 lbs

Wheel load (triple mast assembly truck)

Drive . . . . 4,080 lbs

Steer . . . . 5,000 lbs

SECTION 2

PREPARATION FOR USE

2-1. GENERAL.

2-2. This section describes the procedures required to place the electric fork lift truck into operating condition upon receipt. The sparking units such as motor, controller, contactors, switches and other sparking devices are insulated or enclosed in metal boxes. Whenever any sealed parts are opened for inspection, repair or lubrication, make sure that they are properly enclosed and sealed before the truck is put back into operation.

2-3. The truck is shipped as a completed unit except for the separately packed components (para. 2-8). After the separately packed components are installed, the preservatives removed (para. 2-6) and the inspection performed (para. 2-5) the truck may be entered into service. No other installation or setting up procedures are required other than operator orientation and training.

2-4. UNPACKING AND INSPECTION.

2-5. Unpack and inspect the equipment received as follows:

1. Remove tape, paper, or other packing. Use care when unpacking separately packaged components to account for all hardware.

2. Inspect for missing components by checking equipment received against packing list.

3. Inspect exterior surfaces for broken or dented parts, and for damaged painted surfaces.

4. Inspect visible wiring and hydraulic lines for cuts, breaks, or other damage.

5. Inspect the lift chain and carriage assembly for damage.

2-6. CLEANING AND LUBRICATION.

2-7. Clean and lubricate the truck as follows:

1. Remove with a drycleaning solvent all preservative compound from exposed metal surfaces. Because this compound is not a lubricant, take special care to see that it is completely removed from all wearing surfaces. Lubricate truck (para 5-10).

2. Fill drive axle, hydraulic tank and master cylinder with proper lubricant.

2-8. INSTALLATION OF SEPARATELY PACKAGED COMPONENTS.

2-9. FIRE EXTINGUISHER. Remove separately packed fire extinguisher and install in bracket at front of truck. Be certain bracket clamp locks properly to secure fire extinguisher in position.

2-10. DIRECTIONAL CONTROL SWITCH KNOB. Screw directional control switch knob onto lever of directional control switch secured to steering gear column.

2-11. HEADLIGHT. Install headlight as follows:

1. Secure headlight to left side of outer upright with two screws, nuts and lock washers.

2. Remove headlight guard, bezel and sealed beam light.

3. Insert conduit through rear of headlight shell and connect conduit leads securely to headlight terminals.

4. Install sealed beam light, bezel and headlight guard using the same hardware that was removed.

5. Inspect the controls and instruments for breaks, cracks, bends, or other defects.

2-12. FORKS. Pull up ring catch on fork, position fork in desired location on carriage and release ring catch to lock fork on carriage. Repeat to install other fork.

2-13. BATTERY. The battery is a 36-volt storage type, shipped dry and separately from the equipment. The electrolyte is also packed in a separate container. Fill the battery with electrolyte to the level 3/8 inch above the plates and connect the battery to a charger until it is fully charged.

To install battery, proceed as follows:

1. Open battery compartment top and side doors. Latch top door to overhead guard.

2. Using a hoist rated at more than 2,000 pound capacity, lift battery by hooks inserted through lifting eyes at each side of battery. Use a spreader bar as wide as the battery between the lifting hooks to avoid an inward pull on the battery case.

WARNING

Avoid contact with the battery electrolyte. If the solution comes in contact with the skin, rinse the area immediately with clean water to avoid skin burns. Do not smoke or use an open flame in the vicinity when servicing batteries as they generate hydrogen, an explosive gas.

3. Position battery between battery clamps in battery compartment and remove hoist. Tighten battery clamp screws to prevent battery movement.

4. Connect battery leads securely at battery receptacles and close battery compartment doors.

2-14. MOVEMENT TO WORKSITE.

2-15. **LOCAL WORKSITE.** When the new worksite is near, the fork lift truck may be operated under its own power if the area is relatively level. If the ground is rough, sandy, or muddy, the fork lift may be loaded into a truck, trailer, or other carrier to be moved. No dismantling of the truck is required for movement to a local worksite.

2-16. **DISTANT WORKSITE.** When the fork lift truck must be moved to a distant worksite, it may be loaded onto a truck, trailer, or other carrier and secured with block, strapping, cables and the like. Disconnect the battery cable connector before transporting the fork lift truck. The only reinstallation after movement required is the connection of the battery cable connector with its mating receptacle.

SECTION 3

OPERATING INSTRUCTIONS

3-1. GENERAL.

3-2. This section describes, illustrates, locates, and furnishes the operator with sufficient information about the various controls and instruments to insure proper operation of the electric fork lift truck, Baker Model FTD-040-EE.

3-3. CONTROLS. (Refer to figure 3-1)

3-4. BATTERY SWITCH. When the battery connector is mated and the battery connector lever is operated to the locked (down) position, the lever operates the battery switch. The switch is in series with the panic switch and seat switch to the master switch relay. This switch must be closed before the truck can be operated.

3-5. OPERATOR'S SEAT. As the operator places his weight on the operator's seat, a seat switch is closed to enable operation of the truck. Simultaneously, the mechanical travel motor brake is released. As the driver removes his weight from the seat, the motor brake is engaged and the electrical circuit of the truck is disabled.

3-6. HORN BUTTON. The horn button is located in the center of the steering handwheel. Depressing the button energizes the horn to sound an audible alarm.

3-7. PARKING BRAKE LEVER. The parking brake lever is located to the right of the operator's seat in front of the cowl. The up position of the lever applies and sets the mechanical brake which holds the truck in a stationary position. Twisting the lever clockwise and returning it to the down position releases the mechanical brake.

3-8. STEERING WHEEL. The steering wheel controls the direction of travel of the truck. Turning the steering wheel clockwise moves the truck to the right; turning the steering wheel counterclockwise moves the truck to the left.

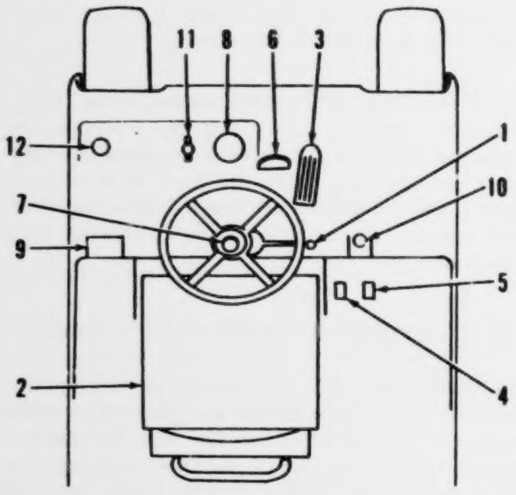
3-9. ACCELERATOR PEDAL. The accelerator pedal is adjacent to the brake pedal, convenient to the operator's right foot. The distance the accelerator pedal is depressed determines the speed and acceleration desired by the operator. Released pressure on the pedal slows the speed of the truck.

3-10. LIGHT SWITCH. The light switch is located on the left side of the instrument panel. The ON position of the switch turns on the headlight and taillight. The OFF position of the switch turns off the headlight and taillight.

3-11. PANIC BUTTON. The panic button is located to the left of the light switch. Normal condition of the switch is the up position. The depressed position of the switch disables the power circuit to the truck.

3-12. LIFT CONTROL LEVER. The lift control lever is located on the cowl to the right of the operator's seat. The rear position of the lever lifts the forks. The forward position of the lever lowers the forks. The mid position of the lever maintains the forks at any desired height.

3-13. TILT CONTROL LEVER. The tilt control lever is located directly to the right of the lift control lever. The forward position of the tilt control lever tilts the forks forward. The rear position of the lever tilts the forks backward. The mid-position of the lever maintains the fork at any desired tilt angle.



1. Direction Lever
2. Seat
3. Accelerator Pedal
4. Hoist Lever
5. Tilt Lever
6. Brake Pedal
7. Horn Button
8. Hour Meter
9. Battery Switch
10. Hand Brake
11. Light Switch
12. Panic Switch

Figure 3-1. Controls and Instruments

3-14. DIRECTION CONTROL LEVER. The direction control lever is located on the right side of the steering column. This lever provides three position control of truck direction; forward, off, and reverse. The forward position of the lever provides forward travel, the mid-position off, and the backward position for reverse travel. The lever is left in the mid-position when the truck is parked. Mechanical linkages attached to the operator's seat automatically return the lever to the mid-position when the operator rises from the seat. The directional control lever may be used for either forward or reverse torque braking by moving the direction control lever to the opposite direction of travel. The truck will come to almost a complete stop before going in the opposite direction.

3-15. BRAKE PEDAL. The brake pedal is located on the floor immediately to the right of the steering column. When depressed, the brake pedal operates the hydraulic brake system to stop the truck. Operation of the brake pedal also lights the rear stoplight.

3-16. SEAT ADJUSTER. The seat adjuster is located on the lower left side of the operator's seat. The outward position of the lever (away from the operator) releases the seat and enables it to be moved forward or backward, as desired. Returning the adjuster lever to the inward position locks the seat in position.

3-17. HOURMETER. The hourmeter is the only instrument used on this truck. It is located on the instrument panel to the right of the panic switch. This meter operates only when the truck is in motion. The figure (extreme right center) records 10th of an hour. The small indicator (upper right) visibly turns when the meter is recording.

3-18. OPERATION UNDER USUAL CONDITIONS.

3-19. GENERAL. The instructions in this section are published for the information and guidance of personnel responsible for operation of the fork lift truck. The operator must know how to perform every operation of which the fork lift truck is capable. Instructions include starting and stopping the fork lift truck, operating the lift and tilt system, and on coordinating the basic motions to perform the specific tasks for which the equipment is designed. Since nearly every job presents a different problem, the operator may have to vary given procedures to fit the individual job.

3-20. STARTING. The recommended starting procedure for the electric fork lift is as follows:

1. Mount truck and take position in operator's seat.

2. Check that battery connector lever is in down position and battery switch is closed.

3. Check that panic button is pulled up.

4. Depress brake pedal with right foot, and simultaneously release parking brake lever with right hand.

5. Move the lift control lever gradually to the rear to raise the forks to normal traveling position (8 to 10 inches above working surface). Release control lever when traveling position of forks is reached.

6. Move the tilt control lever backward and tilt the forks backward. Release lever when forks are sufficiently tilted.

7. Move the direction control lever from the center-off position to forward or reverse position, depending on travel direction desired.

8. Remove foot from brake pedal and place on accelerator pedal. Gradually depress accelerator pedal until truck begins to travel. Continue to depress the accelerator pedal until safe operating speed is attained.

3-21. STOPPING. The recommended stopping procedure for the electric fork lift truck is as follows:

1. Remove foot from accelerator pedal.

2. Apply gradual pressure on brake pedal to bring the truck to a safe smooth stop. Avoid sudden stops.

3. Apply parking brake.

4. Move direction control lever to the center-off position.

5. Move tilt control lever forward to bring mast to vertical position and release lever.

6. Move the lift control lever forward to lower forks to ground and release lever.

7. As operator leaves the seat, the travel motor brake is applied and the seat switch is opened to disable the electrical system. The direction control lever is also automatically returned to the center-off position.

3-22. EMERGENCY STOPPING. The mechanical brake is automatically applied when the operator's weight is removed from the seat. The power circuit is automatically opened whenever the operator depresses the panic switch mounted on the instrument panel. Either above procedure will permit emergency stopping of the truck.

3-23. PICKING UP LOAD. The procedure for picking up the load is as follows:

1. Approach load squarely with forks spaced to divide load evenly, halting truck when load is directly in front of forks.

2. Operate tilt control lever forward to bring mast assembly to vertical position.

3. Operate lift control lever to raise or lower forks to proper height to pick up load.

4. Slowly move truck forward until forks are positioned directly under load. Make certain forks are fully inserted in pallet or under load.

5. Apply parking brake to prevent truck from shifting position during lifting operation.

6. Operate direction control lever to center-off position.

7. Operate lift control lever to rear and raise load approximately 12 inches above ground level and release lever.

8. Operate tilt control lever backward to tilt forks backward and release lever.

3-24. MOVING LOAD. The load is transported in the following manner:

1. Operate direction control lever from center-off position to proper forward or backward position for desired direction of travel.

2. Release the parking brake lever.

3. Slowly depress accelerator pedal, and move the load to the desired location.

WARNING

The operator must be alert at all times while operating the fork lift truck. Failure to observe this warning can result in serious injury or death to the operator or other personnel.

3-25. DEPOSITING LOAD ON TIERED STACK. The load is deposited on a tiered stack as follows:

1. Operate lift control lever to rear until load height is above tier.

2. Slowly drive truck forward until load is positioned directly over tier.

3. Apply parking brake.

4. Operate direction control lever to center-off position.

5. Operate tilt control lever forward to tilt load squarely over tier.

6. Operate lift control lever forward and carefully lower load into position on tier. Continue to lower forks until free of pallet.

7. Operate direction control lever to reverse position.

8. Release parking brake lever.

9. Slowly back the truck away from tiered stack until the forks are clear.

10. Operate lift control lever forward to lower forks into normal traveling position (8 to 10 inches above surface).

3-26. DEPOSITING LOAD IN STORAGE AREA. The load is placed in a level storage area as follows:

1. Carefully drive up to position where load is to be deposited.

2. Depress brake pedal to halt truck.

3. Apply parking brake.

4. Operate direction control lever to center-off position.

5. Operate tilt control lever forward to bring the mast assembly to the vertical position, and release lever.

6. Operate lift control lever forward and carefully lower load to ground. Continue to lower forks until free from under load.

7. Operate direction control lever to reverse position.

8. Release parking brake lever.

9. Slowly back truck away from deposited load.

3-27. BATTERY CARE.

3-28. Every 8 hours of after a day's work with the truck, the operator must have the battery charged overnight for efficient operation of the fork lift truck the following day. **Refer to TM 10-1690A for battery maintenance.**

3-29. OPERATION UNDER UNUSUAL CONDITIONS.

3-30. OPERATION IN EXTREME COLD. In temperatures below 0 deg F:

1. See that hydraulic reservoir is filled to proper level. (Refer to figure 2-1.) Inspect for leaks at all accessible lines, hoses and fittings.

2. Inspect brakes for proper operation.

3. Keep battery fully charged. Maintain electrolyte level.

4. Be extremely careful when handling hoses, lines, or wiring to avoid breakage.

5. Wipe exposed areas dry with a clean cloth.

3-31. OPERATION IN EXTREME HEAT. In temperatures of extreme heat:

1. Make certain that hydraulic reservoir is filled to proper level.

2. Inspect lines and fittings for breaks or leaks.

3. Inspect and maintain battery electrolyte level.

3-32. OPERATION IN DUSTY OR SANDY AREAS. To protect the electric fork lift truck as much as possible in these areas:

1. Shield the fork lift truck from dust and sand as much as possible when not in use. Take advantage of natural barriers which offer protection from dust and sand.

2. Check air filter frequently for clogged condition. Wipe dust and dirt from filter area before removing from reservoir. Wipe dust and dirt from cylinders frequently as sand and dust acts as an abrasive and can damage the lift cylinders.

3. Clean all lubrication points thoroughly before applying lubricants.

4. Wipe dust and dirt from all external areas regularly.

3-33. OPERATION UNDER RAINY OR HUMID CONDITIONS. If unit is outside and not operating, protect it with a canvas or other waterproof covering. Remove cover during dry periods. Keep hydraulic reservoir full to avoid condensation. Wipe excess moisture from external surfaces.

3-34. OPERATION IN SALT-WATER AREAS. In areas where salt water is a problem to the equipment:

1. Wash the unit frequently with clean, fresh water. Do not contaminate hydraulic system or damage electrical components.

2. Coat exposed metal surfaces with rustproofing material. Remove rust immediately and apply paint or oil as applicable.

3-35. OPERATION OF AUXILIARY EQUIPMENT.

3-36. FIRE EXTINGUISHER. (Dry Chemical Type) The dry chemical type fire extinguisher is effective in areas where ambient temperature is -25 deg F. and above. If winterized (pressurized with nitrogen), the fire extinguisher may be used in temperatures below -25 deg F. The fire extinguisher is a 2-1/2 pound, stored pressure, lever-operated extinguisher. To operate the fire extinguisher, proceed as follows:

1. Disconnect clamp that secures extinguisher on mounting bracket, swing clamp open, and remove extinguisher.

2. Hold extinguisher upright, aim nozzle at base of fire and raise operating lever.

3. Direct discharge at base of fire with a side-to-side sweeping motion.

CAUTION

Weigh the fire extinguisher every 6 months. Replace the extinguisher if the weight is less than 4-1/2 pounds, or the pressure is below 125 pounds.

SECTION 4

PRINCIPLES OF OPERATION

4-1. GENERAL.

4-2. This section presents the principles of lift truck control panel operation, and includes the distribution of electrical power for the operation of its various accessories. The control panel circuit controls the operation and speed of the travel motor, the hydraulic pump motor and the power steering motor through relays whose contacts are designed with high power handling capabilities. Secondary circuits, such as the lights and horn are switch operated. The following material is presented using figures 4-1 and 4-2 as reference. Figure 4-1 is a schematic diagram of the control circuitry, and figure 4-2, a wiring diagram.

4-3. POWER CIRCUIT CONTROL.

4-4. Power for the operation of the electric truck is received from the 36-volt battery, whose application to the various circuits is controlled by master switch relay 1MS. Two conditions are required to operate this relay; (1) the battery switch mounted on the battery compartment wall on the lift side of the seat must be closed, and (2) the seat switch must be operated. This, then completes the battery circuit through fuse 8FU, the battery switch, the panic switch, the seat switch, master switch relay 1MS and the diode across terminals 4 and 5 of suppresser 4SP to the positive side of the battery. When relay 1MS is energized, normally-open contacts 1MS close (pick up) to enable available power for electric truck operation.

4-5. TRAVEL MOTOR CONTROL.

4-6. The travel motor is a series field traction motor under the control of silicon controlled rectifiers (SCR) for creep and low speeds, and essentially directly across the battery for high speed travel. Operation of the travel motor for creep and slow speeds is described under three modes of operation; pre-charge, turn-on and turn-off. Higher speed control follows in the latter part of the text.

4-7. PRE-CHARGE. Pre-charge occurs when the directional controller is set in either the forward or reverse position and the accelerator switch is depressed to the position where the INITIAL contacts close. This condition generates a short duration from control pack 1CP which is delayed to rectifier 1SCR but applied directly to rectifier 2SCR, allowing it to conduct. With the directional switch in the forward position, a voltage path is thus completed from control pack 2CP, line 2PL6, the travel motor thermocouple, the brake switch, the closed INITIAL contacts of the accelerator switch and closed 1 CIRC FWD contacts of the directional switch to the forward relay. When the relay energizes, its normally-closed F contacts open and normally-open F contacts close. This establishes a voltage path through fuse 12FU, the travel motor, normally-open F contacts of the forward relay, the series field of the travel motor, the normally-closed R contacts of the reverse relay, transformer 1T primary and across capacitor 1C and conducting rectifier 2SCR. This permits capacitor 1C to charge to battery voltage. As the capacitor charges, current through rectifier 2SCR reduces to zero, and when the capacitor voltage reaches battery voltage rectifier 2SCR cuts off. The polarity of terminal 2 of 1C is positive with respect to terminal 1. During pre-charge, the travel motor does not receive enough power to produce torque.

4-8. TURN-ON. Turn-on occurs when the delayed gate pulse from control pack 2CP reaches and opens the gate of rectifier 1SCR, allowing it to conduct. Conduction of rectifier 1SCR permits travel motor current to increase through the primary winding of transformer 1T to induce a voltage in the secondary. This voltage source is in series with the battery. This induced voltage in the secondary produces a current in the direction of the dot. Capacitor 1C thus reverses polarity; its charging path completed through coil 1L, rectifier 1SCR, transformer 1T SEC and diode 3RC. During turn-on time, the travel motor receives power to produce drive torque, the speed of the motor governed by the width of the pulse. Pulse width, in turn, is controlled by the speed potentiometer. For slow and moderate speeds, pulse width is short; for higher speeds, pulse width is longer.

4-9. TURN-OFF. Turn-off occurs when the gate pulse is applied to rectifier 2SCR. This permits capacitor 1C to discharge through it and rectifier 1SCR in a direction opposite to the load current. When the capacitor discharges, current through rectifier 1SCR reduces to zero, and the rectifier cuts-off. This permits capacitor 1C to charge again to battery voltage, and, when charged, causes rectifier 2SCR to cut-off.

4-10. HIGH SPEED CONTROL. For full speed cruising, the solid state control circuit is bypassed by the application of a voltage developed in control pack 2CP and applied across shorting contactor relay SC. This voltage is delivered across the relay when the 'final' contacts in the accelerator switch close. When the relay energizes, its SC contacts close to permit travel motor current to flow through field weakening pack FWP. This effectively applies full battery power across the travel motor. Additionally, a second set of SC contacts close to permit battery voltage to energize field weakening relay FW. The circuit established is through fuse 6FU, the closed SC contacts, field weakening pack FWP and the FW relay. When the relay energizes, its contacts in series

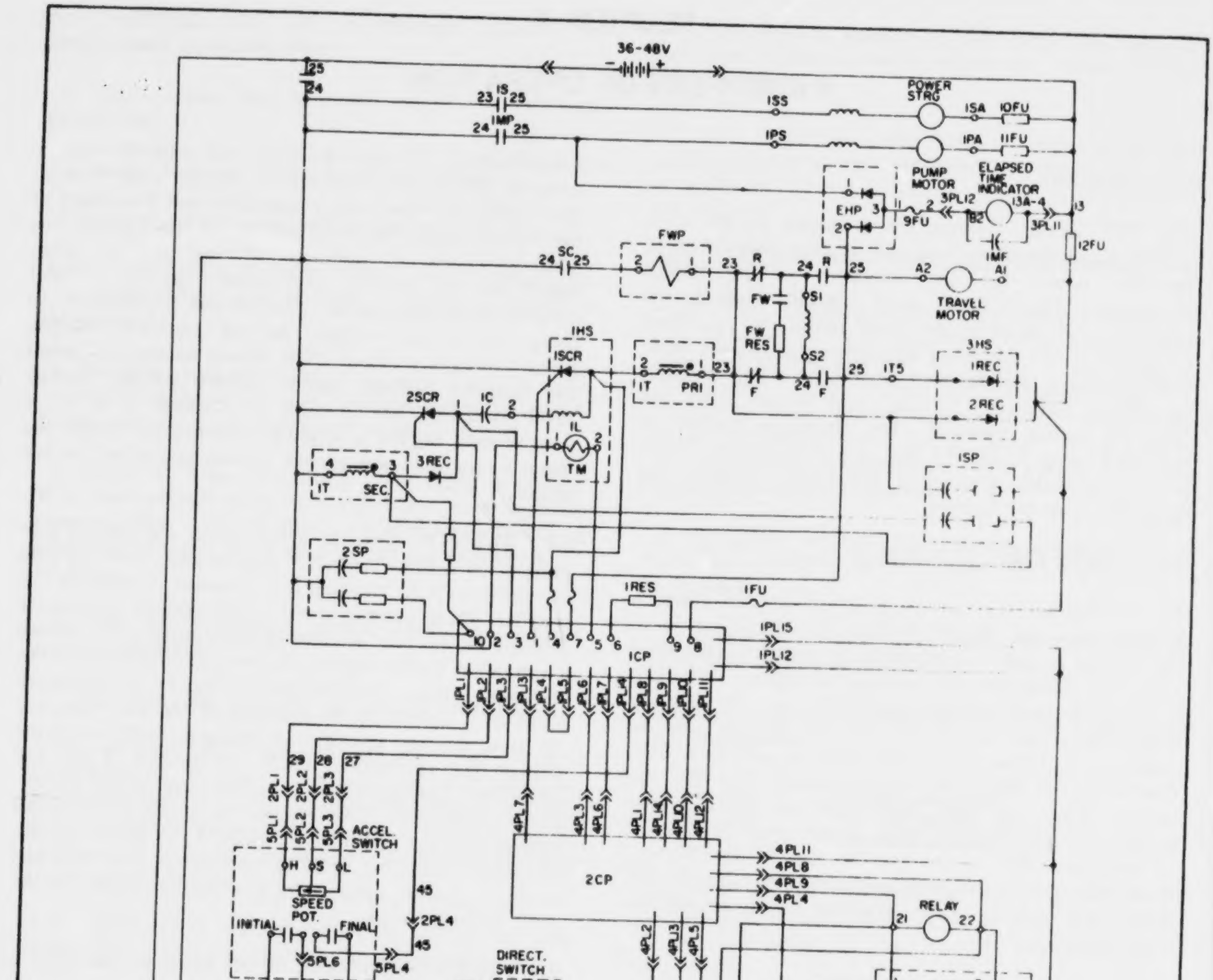

36-48V
POWER STRG
1SA
10FU
1SS
1PS
1PA
11FU
PUMP MOTOR
ELAPSED TIME INDICATOR
EHP
9FU
3PL12
13A-4
3PL11
1MF
12FU
FWP
SC
R
F
FW
FW RES
S1
S2
A2
A1
TRAVEL MOTOR
1HS
1SCR
2SCR
1C
IL
TM
IT
PRI
SEC
3REC
1T5
3HS
1REC
2REC
1SP
2SP
1RES
1FU
1PL15
1PL12
1CP
2CP
ACCEL. SWITCH
SPEED POT.
INITIAL
FINAL
5PL6
5PL4
2PL4
5PL7
5PL5
BRAKE SWITCH
TRAVEL MOTOR THERM.
6PL1
2PL5
DIRECT. SWITCH
FWD
REV
#1 CIRC.
#2 CIRC.
6PL2
6PL3
6PL5
2PL10
2PL11
6PL6
6PL4
2PL9
STRG. MOTOR THERM.
2PL1
2PL7
2PL8
4PL11
4PL8
4PL9
4PL4
RELAY
3SP
ARP
STEERING RELAY
4SP
MASTER SWITCH RELAY
6FU
7FU
8FU
4FU
5FU
3PL1
PUMP SWITCH
PUMP MOTOR THERM
HYDR OIL THERM
3PL2
3PL3
PANIC SWITCH
SEAT SWITCH
3PL4
3PL5
BATTERY SWITCH
HORN
HORN SWITCH
1MFD-600V
13A-1
3PL6
3PL7
LIGHT SWITCH
SPOT LIGHT
13A-2
3PL10
13A-5
3PL8
3RES
BRAKE SWITCH
3PL9
7PL1
7PL2
TAIL AND STOP LIGHT

Figure 4-1. Control Panel Circuit, Schematic Diagram

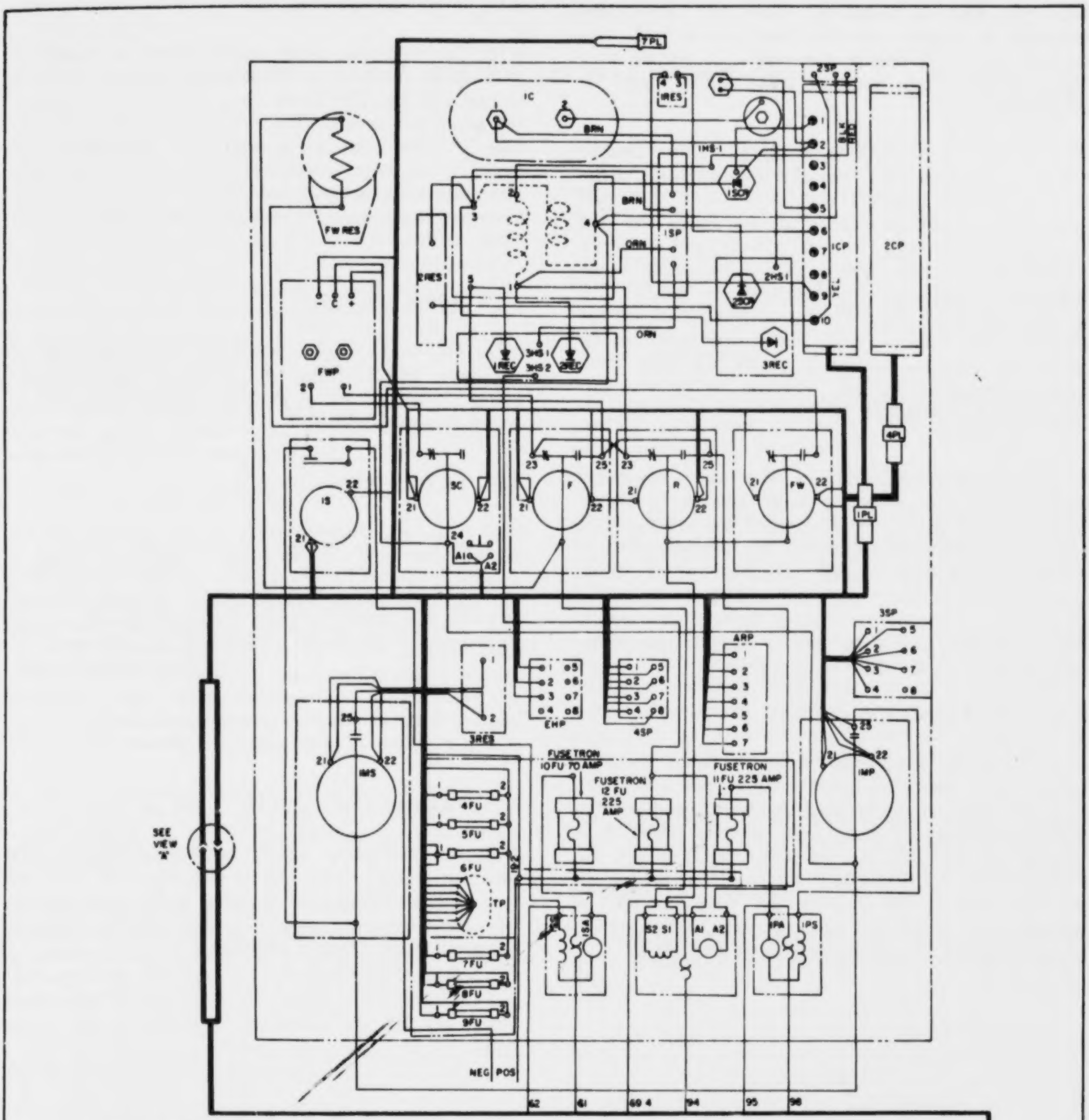

7PL
IC
IRES
23P
BRN
IMS-1
ISCR
ISP
ORN
2HS1
2SCR
ICP
2CP
13A
FW RES
2RES
FWP
IREC
2REC
3HS1
3HS2
3REC
4PL
IPL
IS
SC
F
R
FW
3SP
ARP
EHP
4SP
3RES
IMS
IMP
FUSETRON 10FU 70 AMP
FUSETRON 12 FU 225 AMP
FUSETRON 11FU 225 AMP
4FU
5FU
6FU
TP
7FU
8FU
9FU
NEG
POS
SEE VIEW "A"
VIEW "A"
62
61
69 4
94
95
98
HYDR OIL THERM
SPOT LT
ETI
BATT SW
PANIC SW
HORN SW
HORN
FINAL
INITIAL
ACCEL CONTROL
DIRECT CONTROL
BRAKE SW
SEAT SW
PUMP SW

Figure 4-2. Control Panel Circuit, Wiring Diagram

with FW RES (a resistance) close, to connect the resistance in parallel with the travel motor field. This weakens the field, causing the motor to operate at a higher speed. Thus, cruising travel motor speed is established.

4-11. PLUGGING CONTROL. Plugging is a term used to define the situation where the direction of motion of the truck is suddenly reversed. When this occurs, the travel motor series field is reversed during travel and the armature counter emf reverses polarity and tends to increase the effective system voltage by acting as an additional voltage source in series with the battery. This would create high braking currents to circulate around the armature field. Diode 1REC, across the travel motor, clamps the armature voltage to a very low value when travel direction is suddenly changed to prevent this armature voltage buildup.

4-12. TURN-OFF PROTECTION. When silicon controlled rectifier 1SCR is cut-off, a large amount of energy remains stored in the inductances of the travel motor armature and field. This energy, if left to dissipate itself, would produce high voltage transients which would appear across the cut-off SCR and lead to the possibility of shorting out the device. Flyback diode 2REC prevents this by establishing a series path to dissipate this energy through itself, the armature and the field.

4-13. POWER STEERING CIRCUIT.

4-14. The power steering circuit is completed when the master switch relay is energized and the directional switch is placed either in the forward or reverse position. The completed circuit of the power steering relay 1S is through fuse 6FU, the steering motor thermocouple, the FWD or REV 2 CIRC section of the directional switch, the ARP pack to the 1S relay coil. When the relay is energized, its 1S contacts close to apply battery voltage across the power steering motor through fuse 10FU.

4-15. PUMP MOTOR CIRCUIT.

4-16. The hydraulic pump motor circuit is completed when either the hoist or tilt control is operated from the neutral position. This closes the pump switch to energize the pump motor relay. The completed circuit is through fuse 7FU, the closed pump switch, the pump motor and hydraulic oil thermocouples to pump motor relay 1MP. When the relay energizes, its 1MP contacts close to apply battery voltage across the pump motor through fuse 11FU.

4-17. HORN CIRCUIT.

4-18. The horn circuit is energized by the operation of the horn switch. When the switch is closed, battery voltage is applied across the horn through fuse 8FU to sound an audible alarm.

4-19. LIGHT CIRCUIT.

4-20. The light circuit consists of the spotlight and the tail and stoplight. The spot and taillights are energized simultaneously by the operation of the light switch. When the switch is closed, battery voltage is applied through fuse 5FU directly across the spotlight and also across series resistor 3RES and the tail and stoplight. Thus the tail and stoplight illuminates at a reduced brilliance. When the brake switch is closed, resistance 3RES is bypassed and full battery voltage is applied directly across the tail and stoplight for full brilliance.

4-21. HOURMETER CIRCUIT.

4-22. The hourmeter circuit consists of elapsed time indicator ETI, the two EHP diodes, capacitor 1MF and fuse 9FU. The hourmeter is placed in the circuit so that whenever the travel motor or pump motor circuit is energized, elapsed time is recorded.

SECTION 5

PREVENTIVE MAINTENANCE

5-1. GENERAL.

5-2. The fork lift truck must be inspected periodically and systematically to insure that it is ready for operation at all times. Correct all defects discovered before they result in serious damage or failure. The necessary preventive maintenance checks and services are listed and described below. The item numbers indicate the sequence of minimum inspection requirements. Note all defects discovered during operation of the unit for future correction, and make these corrections as soon as operation has ceased. Stop operation immediately if deficiency noted during operation would damage the equipment if operation were continued.

5-3. CHECKS AND SERVICES.

5-4. SCOPE. This paragraph contains tabulated listing of preventive maintenance checks and services. Refer to Table 5-1 for the preventive maintenance checks and services. The items are listed consecutively and indicate the sequence of minimum preventive maintenance requirements on the truck.

5-5. INTERVALS. Inspect truck each time it is operated. This service is divided into three parts:

a. Before-Operation Service. This is a brief service to ascertain that the truck is ready for operation; it is mainly a check for conditions affecting truck readiness since the last after-operation service.

b. During-Operation Service. This service consists of detecting unsatisfactory performances. While driving or operating the truck, be alert for any unusual noises or odors, steering irregularities, or any other indication of malfunction of any part of the truck. Every time a load is picked up or deposited, the brakes applied, the truck accelerated or turned, consider it a test and note any unusual or unsatisfactory performance.

c. After-Operation Service. This is the basic daily service for all trucks. It consists of correcting, so far as possible, any operating deficiencies noted to prepare the truck for immediate use.

5-6. GENERAL PROCEDURES FOR SERVICES AND INSPECTIONS.

5-7. GENERAL INSPECTIONS. General inspections are performed to check that items are in good condition, correctly assembled, secure, not excessively worn, not leaking, and adequately lubricated. These inspections apply to most items in the preventive-maintenance and inspection procedures. Any or all checks pertinent to any item (including supporting, attaching or connecting members) are performed automatically as general procedures, in addition to any specific procedures given. General inspection instructions are as follows:

1. Visually inspect unit for safety or serviceability. Good condition is explained further as meaning: not bent or twisted, not chafed or burned, not broken or cracked, not bare or frayed, not dented or collapsed, not torn or cut, not deteriorated.

2. Inspect for correct assembly. Observe unit for normal position in the truck and that all parts are present and in their correct relative positions.

3. Inspect for security. Perform visual, hand-feel, pry-bar, wrench, or screwdriver inspection for looseness in the unit. Include any brackets, lockwashers, locknuts, locking wires, and cotter pins as well as any connecting tubes, hoses, or wires.

4. Inspect for wear. Note items worn beyond serviceable limits, or likely to fail if not replaced before the next scheduled inspection. Excessive wear of mating parts or linkage connections is usually evidenced by too much play (lash or lost motion). It includes illegibility as applied to markings and data plates, and printed matter.

5-8. GENERAL CLEANING. Any special cleaning instructions required for specific mechanism or parts are contained in the pertinent section. General cleaning instructions are as follows:

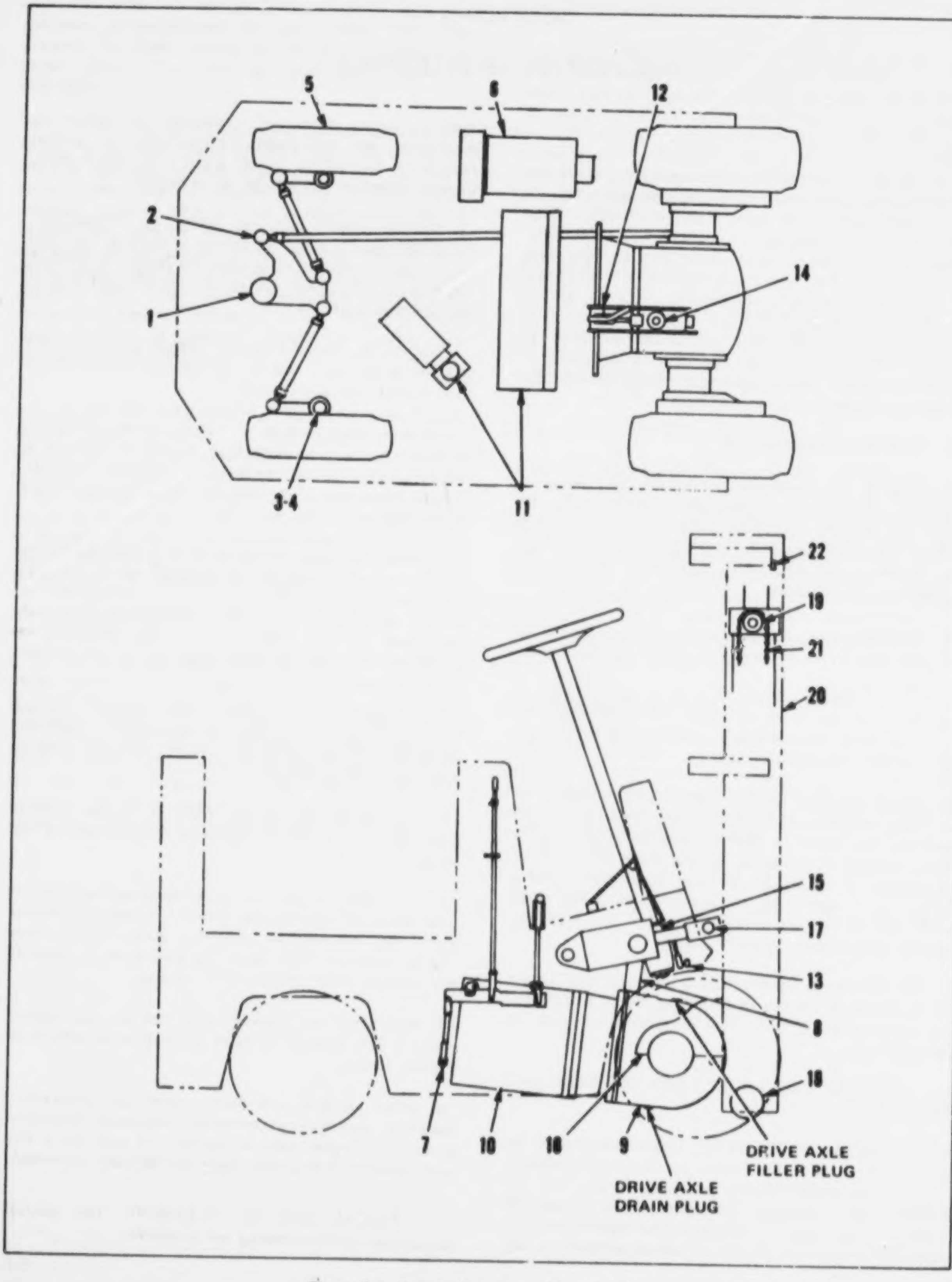
1. Use dry-cleaning solvent (SD) or volatile mineral spirits to clean or wash grease or oil from all parts of the truck.

2. A solution of one part grease-cleaning compound to four parts of dry-cleaning solvent or volatile mineral spirits may be used for dissolving grease and oil from chassis, mast and other parts. Use cold water to rinse off any solution which remains after cleaning.

3. After parts are cleaned, rinse and dry thoroughly. Apply a light grade of oil to all polished metal surfaces to prevent rusting.

4. Before installing new parts, remove any preservative materials, such as rust-preventive compound, protective grease, etc. Prepare parts as required (oil seals, etc.). For parts requiring lubrication, apply the lubricant prescribed.

5-9. PRECAUTIONS IN CLEANING. The general precautions used in cleaning are as follows:


5
6
12
2
14
1
3-4
11
22
19
21
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15
17
13
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18
7
10
18
9
DRIVE AXLE FILLER PLUG
DRIVE AXLE DRAIN PLUG

Figure 5-1. Lubrication Chart (Sheet 1 of 2)

Lube Point No.	Part	8 Hours or Daily	40 Hours or Weekly	200 Hours or Monthly	1000 Hours or Semi-Annually	Type of Service	Key	Quantity Required
1	Bellcrank Pin Fittings		X			Pressure Fitting	M.G.	1
2	Steering Linkage Fittings		X			Pressure Fitting	M.G.	5
3	Spindle Pins Fittings		X			Pressure Fitting	M.G.	4
4	Spindle Pin Thrust Bearing				X	Repack	M.G.	2 Brgs.
5	Wheel Bearings Steering Axle				X	Repack	M.G.	4 Brgs.
6	Pump Motor Bearings				X	Repack	M.G.	2 Brgs.
7	Seat and Hand Brake Pivot Point	X				Hand Lubricate	E.O.	6
8	Pitman Arm Fitting		X			Pressure Fitting	M.G.	1
9	Power Axle		0, X		C	Maintain to Level of Plug	G.L.	10 Pts.
10	Drive Motor Bearings							2 Brgs.
11	Hydraulic System Including Reservoir			0	C	Maintain to Level	H.O.	8 Gals.
12	Brake Pedal Pivot and Link Pin		X			Hand Lubricate	E.O.	As Req'd
13	Accelerator Pivot Points (3)		X			Hand Lubricate	E.O.	As Req'd
14	Master Brake Cylinder		0, X			Fill	B.F.	As Req'd
15	Steering Gear			0, X		Maintain to Level of Plug	M.G.	As Req'd
16	Upright Tilt Pivot Fittings		X			Pressure Fitting	M.G.	2
17	Tilt Cylinder Pivots		X		X	Pressure Fitting	M.G.	4
18	Carriage Rollers (4)				X	Hand Pack	M.G.	As Req'd
19	Cross Head Fittings		X			Pressure Fitting	M.G.	2
20	Uprights - Brush on Mating Sides			X		Hand Brush	G.G.	As Req'd
21	Roller Chain - Clean with Wire Brush Before Oiling		X			Hand Brush	E.O.	As Req'd
22	Latch Fitting		X			Pressure Fitting	M.G.	1

0 = Inspect X = Service C = Change

M.G. - Multi-Purpose Lithium Base Grease
E.O. - SAE 30 Engine Oil (MIL-L-2104B)
G.L. - SAE 90 Multi-Purpose Gear Oil (MIL-L-2105B)
B.F. - Brake Fluid, Heavy Duty (VV-H-910)
H.O. - SAE 10 Engine Oil (MIL-L-2104B)
G.G. - Graphite Grease or Moly Grease

Figure 5-1. Lubrication Chart (Sheet 2 of 2)

1. Dry-cleaning solvent and volatile mineral spirits are inflammable and not to be used near an open flame. Provide fire extinguishers when these materials are used. Use only in well-ventilated places.

2. These cleaners evaporate quickly and have a drying effect on the skin. If used without gloves, they may cause cracks in the skin, and in the case of some individuals, a mild irritation or inflammation.

3. Avoid getting petroleum products, such as dry-cleaning solvent, volatile mineral spirits, engine fuels or lubricants on rubber parts as they will deteriorate the rubber.

4. The use of diesel fuel oil, gasoline or bensene (benzol) for cleaning is prohibited.

5-10. LUBRICATION.

5-11. Lubricate all points requiring lubrication shown in lubrication diagram (figure 5-1) at the recommended intervals.

TABLE 5-1. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

Item Number	Inspection Before Operation	Interval During Operation	Weekly	Item to be Inspected	Procedure
1	X		X	Headlight and taillight	Check operation. Replace defective lamp.
2			X	Tires	Check for cuts. Remove embedded foreigh material.
3	X		X	Master cylinder	Check for leaks and loose connections. Fill as required to within 1/4-inch of top.
4			X	Hydraulic oil tank	Check fluid level. Fill as required. Replace dirty air cleaner element.
5			X	Battery	Remove corrosion. Add electrolyte as required.
6	X	X		Brake pedal	Check for strong pressure when brake pedal is applied. Check for excessive travel.
7	X	X		Horn	Check operation. Replace if defective.
8	X	X		Controls and instrument	Check for proper operation. Controls should operate freely with no binding.
9		X		General Truck performance	Check for unusual noise, vibration or any other indication signifying trouble.
10			X	Fire extinguisher	Check for proper charge.
11			X	Tilt cylinders	Check for leaks and loose connections. Mast will tilt evenly when properly adjusted.
12			X	Lift chains	Check for cracked, broken or excessively worn links.
13	X	X		Hoist cylinder	Check for leaks and loose connection.
14	X	X		Handbrake lever	Check for proper operation
15	X			Power axle	Check for lubricant leakage.
16	X	X		Steering gear	Check for lubricant leakage. Check for proper operation.

SECTION 6

CORRECTIVE MAINTENANCE

6-1. GENERAL.

6-2. This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the fork lift truck. Included are troubleshooting information, removal and replacement procedures, and, finally, general overhaul procedures. The procedures include adjustments where required.

6-3. CHARACTERISTICS AND RATINGS.

6-4. ELECTRICAL COMPONENTS. Electrical characteristics of fork lift truck useful to maintenance is as follows:

Hydraulic pump motor voltage (nominal)	36 volts
Hydraulic pump motor horsepower rating at 36 volts	3 hp
Hydraulic pump motor speed at 36 volts with 33 foot pound load	1600 rpm ±5%
Hydraulic pump motor current at 36 volts with 33 foot pound load	250 amps ±5%
Hydraulic pump motor stalled rotor torque at 36 volts	60 ft lbs at 400 amps
Hydraulic pump motor field coil resistance at 70 deg F.	0.006 ohms ±10%
Power steering motor voltage (nominal)	36 volts
Power steering motor horsepower rating at 36 volts	1 hp
Power steering motor speed at 36 volts with 2 foot pound load	2700 rpm ±5%
Power steering motor current at 36 volts with 2 foot pound load	30 amps ±5%
Power steering motor stalled rotor torque at 36 volts	67 ft lbs at 500 amps
Power steering motor field coil resistance at 70 deg F	series 0.0190 ohms ± 10% shunt 16 ohms ± 10%
Travel motor voltage (nominal)	36 volts
Travel motor horsepower rating at 36 volts	5.2 hp (approx)
Travel motor speed at 36 volts with 20 foot pound load	890 rpm ±5%
Travel motor current at 36 volts with 20 foot pound load	75 amps ±5%
Travel motor stalled rotor torque at 36 volts	230 ft lbs at 550 amps
Travel motor field coil resistance at 70 deg F.	0.021 ohms ±10%
Accelerator switch potentiometer resistance	0 to 6,000 ohms
Accelerator controller potentiometer resistance with starting contactor energized (shaft rotated approximately 7 deg)	300 ohms
Accelerator controller potentiometer resistance with final switch actuated (shaft rotated approximately 27 deg	30 ohms max.
Directional switch type	DPDT
Pump motor relay type	SPST
Pump motor relay coil resistance at 70 deg F.	30.2 ohms ±10%
Master switch relay type	SPST
Master switch relay coil resistance at 70 deg F.	30.2 ohms ±10%
Forward relay type	SPDT
Forward relay coil resistance at 70 deg F.	25.3 ohms ±10%

Reverse relay type	SPDT
Reverse relay coil resistance at 70 deg F	25.3 ohms ±10%
Shorting contactor relay type	SPST
Shorting contactor relay coil resistance at 70 deg F	25.3 ohms ±10%
Field weakening relay type	SPST
Field weakening relay type coil resistance at 70 deg F	25.3 ohms ±10%
Steering relay type	SPST
Steering relay coil resistance at 70 deg F	46.9 ohms ±10%
Field weakening pack (FWP) resistance at 70 deg F (across terminals 1 and 2)	50,000 ohms dropout 100,000 ohms pickup
Transformer IT primary resistance	0.000835 ohms ±10%
Transformer IT secondary resistance	0.0755 ohms ±10%
Field weakening resistance (FW RES)	0.019 ohms ±10%
Resistor 1 RES resistance	75 ohms ±10%
Resistor 2 RES resistance	4 ohms ±10%
Resistor 3 RES resistance	40 ohms ±10%

6-5. HYDRAULIC COMPONENTS. The hydraulic characteristics are as follows:

Hydraulic fluid type	MIL-L-2104B
Hydraulic fluid viscosity	SAE-10
Hydraulic fluid capacity	8 gals.
Hydraulic system pressure relief setting	1800 psig
Hydraulic pump capacity at 1200 rpm and 1000 psig	8.76 gpm
Hydraulic pump rotation (facing shaft)	CCW
Direction control valve type	2 spool
Tilt cylinder bore	4 in.
Tilt cylinder stroke	3.125 in.
Tilt cylinder closed length	13.000 in.
Lift cylinder extended length - dual	113.594 in.
- triple	129.375 in.
Lift cylinder closed length - dual	65.469 in.
- triple	78.625 in.

6-6. MECHANICAL COMPONENTS. The pertinent mechanical data is as follows:

Steering gear ratio	17.5:1
Steering wheel rotation (lock to lock)	4.122 turns
Drive axle type	double reduction, ring and pinion plus internal to sun gears
Drive axle over-all reduction (including adapter)	12.75:1
Drive axle pinion gear backlash	0.005 to 0.015 in.
Drive axle bevel gear reduction	4-1/9:1
Drive axle brake type	hydraulic drum type

6-7. WEAR LIMITS AND CLEARANCES.

6-8. Table 6-1 lists wear limits and clearances applicable during overhaul of components.

6-9. TROUBLESHOOTING.

6-10. PROCEDURES.

6-11. The first step in any trouble-shooting procedure is to determine the exact symptom. If the symptom involves truck motion, start by jacking up the truck so that the drive wheels are off the floor. From the actual symptom

TABLE 6-1. WEAR LIMITS AND CLEARANCES

Drive axle - axle shaft run out	0.003 inch maximum, total indicator reading
Drive axle - differential bearings	0.000 to 0.003 inch loose preload
Adapter - input gear backlash	0.006 to 0.008 inch
Motor brake shoes	1/16 inch minimum thickness
Service brake shoes	1/16 inch minimum thickness
Steering gear - lash adjuster	0.002 inch end play maximum
Travel motor - brushes	3/4 inch minimum length
Travel motor - armature commutator	4.375 inches minimum diameter, 16 microinch rms surface roughness, 3/64 inch deep by 0.030 inch wide undercutting
Hydraulic pump motor - brushes	1/2 inch minimum length
Hydraulic pump motor - armature	2.375 inches minimum diameter, 16 microinch rms surface roughness, 3/64 inch deep by 0.025 inch wide undercutting
Power steering motor - brushes	1/2 inch minimum length
Power steering motor - armature	1.500 inches minimum diameter, 16 microinch rms surface roughness, 3/64 inch deep by 0.020 inch wide undercutting
Tires	3/4 inch minimum thickness (approximately)

observed, consult the corresponding or most closely associated symptom listed in the left hand column of table 6-2. Adjacent to the symptom column in the table, note the listing of the probable causes, and conduct the corrective actions given.

6-12. TECHNIQUES.

6-13. These techniques are primarily used for locating defects in the electric power control circuit, and stress the approach of using continuity checks (ohmmeter or test light) to determine the condition of a component part. When checking electrical or electronic components, and unless otherwise stated, always disconnect the battery connector. Table 6-3 provides a list of the test equipment required in servicing. Consult figures 4-1 and 4-2 for component locations and connections.

6-14. TESTING SCR'S AND DIODES. It is not necessary to remove these components from the chassis for testing. Proceed as follows:

1. For power diodes (1REC, 2REC and 3REC), remove anode cable connection and connect continuity test light in diode circuit as shown in figure 6-1a. A good diode will light test light when connection is made in one direction and not light when connection is reversed. If test light lights in both connections, diode is defective and must be replaced.

2. For SCR'S (1SCR and 2SCR), remove cathode cable and white gate lead. Connect test light as shown in figure 6-1b. Next, reverse test light connections. In each test, test light should not light. If light comes on, SCR is shorted and must be replaced.

3. To check gate of SCR, connect test light as shown in figure 6-1b. Touch gate lead to mounting block of SCR. Reverse test light connections and repeat test. In one of these tests, test light should light. If test light does not light in either test, replace SCR.

6-15. REPLACING SCR'S AND DIODE. To replace defective SCR or diode, proceed as follows:

1. Use deep socket wrench to remove component from panel. When inserting replacement, apply heat transfer compound to flange and threads.

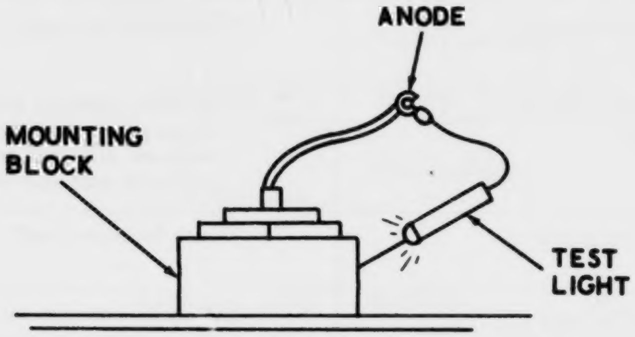
2. Screw component in, applying torque specified:

Stud Size	Torque (pound-inches)
9 to 10	No. 10-32
12 to 15	1/4-28
65 to 75	1/2-20
125 to 150	3/4-16

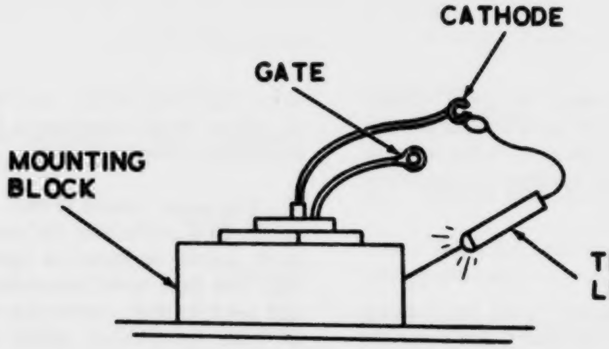
6-16. TESTING COMMUTATING CAPACITOR (1C). When the commutating capacitor is suspected, proceed as follows:

1. Visually observe connecting terminals and condition of case. If terminals are broken, or oil is present on case, replace capacitor.

2. Discharge capacitor by momentarily connecting resistor across terminals.



A. DIODE



B. SCR

Figure 6-1. Test Circuits

TABLE 6-2. TROUBLESHOOTING

Symptom	Probable Cause	Corrective Action
Electrical		
1. Dead truck – Truck completely inoperable.	a. 1MS relay fails to pick-up.	a. With drive wheels off truck off floor, make following checks: (1) Check fuse 8FU and replace if defective. (2) Remove fuse 8FU and, with ohmmeter, check continuity between battery switch, panic switch, seat switch, and relay 1MS coil. Also check suppressor 4SP especially diode between terminals 4 and 5. Replace defective component.
	b. 1MS relay contacts dirty.	b. Clean contacts with crocus cloth or fine flat file.
	c. Defective suppressor 4SP.	c. Check suppressor 4SP using ohmmeter. Replace if defective.
2. Neither forward or reverse operation.	a. Fuses 1FU, 2FU, 3FU or 12FU.	a. Replace defective fuse.
	b. Directional switch circuit.	b. With drive wheels of truck off floor, make following checks: (1) Check fuse 6FU. Replace if defective. (2) Check continuity through No. 2 Circ. FWD & REV contacts of switch with ohmmeter. Replace directional switch if defective.

TABLE 6-2. TROUBLESHOOTING (Cont'd)

Symptom	Probable Cause	Probable Cause
Electrical (Cont'd)		
2. Neither forward or reverse operation. (Cont'd)	c. Defective suppressor 3SP.	c. Check diode across terminals 4 and 5 of suppressor 3SP using ohmmeter. Replace suppressor 3SP if defective.
	d. Defective acceleration switch	d. Check continuity through switch, using ohmmeter, with accelerator pedal depressed. Replace if defective.
	e. Open brake switch.	e. Check continuity through switch using ohmmeter. Replace switch if defective.
	f. Defective control pack 1CP or 2CP	f. Check in accordance with manufacturers' recommendations. Replace defective control packs.
	g. Turn on silicon control rectifiers 1SCR or 2SCR.	g. Check using ohmmeter or test light. Replace defective SCR.
	h. Accelerator speed potentiometer.	h. Check resistance of potentiometer. Replace if defective.
	i. Defective travel motor.	i. Check motor. Remove or repair as required.
3. No forward motion.	a. F relay fails to pick-up.	a. With truck drive wheels off floor, make following checks: (1) Check F relay coil for continuity. Replace if relay is defective. (2) Directional switch. Check for closed FWD contacts. Adjust or replace as required. (3) Check for shorted suppressor circuit between terminals 6 and 4 of 3SP. Replace 3SP if defective.

TABLE 6-2. TROUBLESHOOTING (Cont'd)

Symptom	Probable Cause	Corrective Action
Electrical (Cont'd)		
4. No reverse motion.	a. R relay fails to pick-up.	a. With truck wheels off floor, make following checks: (1) Check R relay coil for continuity. Replace if relay is defective. (2) Directional switch. Check for closed REV contacts. Adjust or replace as required. (3) Check for shorted suppressor circuit between terminals 7 and 4 of 3SP. Replace 3SP if defective.
5. Truck operates at full speeds at low speed settings.		With battery cable disconnected, make following checks:
	a. Shorting contactor 1SC relay.	a. Check for welded SC relay contacts. Replace relay if contacts are damaged.
	b. Turn on 2SCR.	b. Check diode. Replace if defective.
	c. Turn off 1SCR.	c. Check diode. Replace if defective.
	d. Shorted speed potentiometer.	d. Check with ohmmeter. replace if defective.
6. Truck wheels turn at 75% of maximum	a. SC relay fails to pick up.	a. With drive wheels of truck off floor, check following: (1) Shorted speed potentiometer. Check with ohmmeter. Replace if defective. (2) Defective 1CP or 2CP module. Check in accordance with manufacturers' recommendations. Replace defective CP module.

TABLE 6-2. TROUBLESHOOTING (Cont'd)

Symptom	Probable Cause	Corrective Action
Electrical (Cont'd)		
6. Truck wheels turn at 75% of maximum (Cont'd)	b. SC relay.	b. Check resistance of SC relay coil. Replace relay if defective.
	c. 3SP suppressor.	c. Check diodes between terminals 1 and 2 of 3SP module. Replace if defective.
	d. FW pack.	d. Check resistance between terminals 1 and 2 of FWP in series with SC contacts. Replace if defective.
	e. Field weakening contactor fails to pick up.	e. Check fuse 6FU. Replace if defective. Check FW relay coil. Replace if defective. Check FW resistor. Replace if defective.
7. No power steering.	a. Power steering pump motor circuit.	a. Check the following: (1) Fuses 6FU and 10FU. Replace defective fuse. (2) ARP module. Replace if defective. (3) No. 2 Circ. of directional switch. Repair or replace as required. (4) 1S relay coil open or shorted. Check using ohmmeter. Replace if defective. (5) 1S contact of relay coil 1S. Clean contact with crocus cloth or fine file. (6) Diodes between terminals 1 and 4 of 4SP suppressor module. Check with ohmmeter. Replace 4SP module if defective. (7) Power steering motor. Check and replace if defective.

TABLE 6-2. TROUBLESHOOTING (Cont'd)

Symptom	Probable Cause	Corrective Action
Electrical (Cont'd)		
8. No hoist or tilt power.	a. Pump motor ciruit.	a. Check the following: (1) Fuses 7FU and 11FU. Replace defective fuse. (2) Continuity through pump switch. Replace if defective. (3) Pump motor relay coil 1MP for open or short. Check using ohmmeter. Replace if defective. (4) Diodes between terminals 3 and 4 of suppressor module 3SP. Replace 3SP if defective. (5) 1MP contacts of relay coil 1MP. Clean contact using crocus cloth or fine file. (6) Pump motor. Check and replace if defective.
9. Horn does not blow.	a. Horn circuit.	a. Check following: (1) Fuse 4FU. Replace if defective. (2) Shorted capacitor across horn. Replace if defective. (3) Defective horn switch. Replace if defective. (4) Defective horn. Replace if placing 36 volts across horn does not energize it.
10. Neither spotlight or taillights light.	a. Light circuit.	a. Fuse 5FU. Replace if defective.
11. Spotlight does not light.	a. Spotlight circuit.	a. Check following: (1) Check spotlight using 39-volt across terminals if light. Replace if defective.

TABLE 6-2. TROUBLESHOOTING (Cont'd)

Symptom	Probable Cause	Corrective Action
Electrical (Cont'd)		
11. Spotlight does not light. (Cont'd)		(2) Check continuity across light switch. Replace if defective.
12. Tail and stoplight out.	a. Taillight circuit.	a. Check following: (1) Check lights. Replace if defective. (2) Continuity through brake switch with brakes depressed. Replace if defective. (3) Continuity through light switch. Replace if defective. (4) Resistor circuit 3RES. Replace if defective.
Brakes		
1. Brakes dragging.	a. Master cylinder compensating port plugged.	a. Overhaul brake master cylinder (para 6-139).
2. Brake pedal goes to floor, no resistance.	a. High rate of fluid leakage at wheel cylinder.	a. Repair wheel cylinder (para 6-138).
	b. High rate of fluid leakage from master cylinder.	b. Repair brake master cylinder (para 6-139).
3. Brake pedal under force gradually goes to floor.	a. Scored master cylinder barrel or defective cup in master cylinder.	a. Repair brake master cylinder (para 6-139).
	b. Leakage of fluid from wheel cylinder.	b. Repair wheel cylinder (para 6-138).
	c. Leakage of fluid from master cylinder.	c. Repair brake master cylinder (para 6-139).
4. Heavy braking action.	a. Brake backing plate loose on axle housing.	a. Tighten or replace brake backing plate (paras. 6-133 through 6-137).
5. Truck pulls to one side.	a. Brake backing plate loose on axle housing.	a. Tighten or replace brake backing plate (paras. 6-133 through 6-137).

TABLE 6-2. TROUBLESHOOTING (Cont'd)

Symptom	Probable Cause	Corrective Action
Brakes (Cont'd)		
5. Truck pulls to one side. (Cont'd)	b. Fluid on brake lining.	b. Replace brake lining (paras. 6-133 through 6-137).
Steering		
1. Steering difficult.	a. Bent steering column.	a. Overhaul steering gear (para 6-144 through 6-170).
	b. Broken spindle pin on steering axle.	b. Overhaul steering axle (paras. 6-119 through 6-126).
	c. Jammed ball nut in steering gear.	c. Overhaul steering gear (paras. 6-144 through 6-170).
2. Excessive looseness in steering.	a. Steering gears worn.	a. Overhaul steering gear (paras. 6-144 through 6-170).
	b. Tie rod ends worn.	b. Overhaul steering axle (paras. 6-119 through 6-126).
Hydraulic		
1. Lift carriage will not lift load.	a. Hydraulic pump defective.	a. Overhaul hydraulic pump (paras. 6-171 through 6-176).
	b. Defective seals in hoist cylinder.	b. Repair hoist cylinder (paras. 6-194 through 6-199).
	c. Hydraulic pump motor defective.	c. Overhaul pump motor (paras. 6-106 through 6-210).
	d. Hydraulic control valve defective.	d. Overhaul hydraulic direction control valve (paras. 6-181 through 6-188).
2. Load creeps down from raised position.	a. Leakage past rings in hoist cylinder.	a. Repair hoist cylinder (paras. 6-194 through 6-199).
	b. Hydraulic direction control valve defective.	b. Overhaul hydraulic direction control valve (paras. 6-181 through 6-188).
3. Hoisting speed erratic.	a. Bent or distorted mast assembly.	a. Overhaul mast assembly.

TABLE 6-2. TROUBLESHOOTING (Cont'd)

Symptom	Probable Cause	Corrective Action
Hydraulic (Cont'd)		
4. Control valve plungers will not return to neutral.	a. Sticking plungers in control valve.	a. Overhaul control valve (paras. 6-181 through 6-188).
	b. Broken springs or dirt lodged in seats.	b. Overhaul control valve (paras. 6-181 through 6-188).
5. No operation of hydraulic system when first started up.	a. Defective hydraulic pump.	a. Overhaul hydraulic pump (paras. 6-171 through 6-177).
	b. Defective relief valve in control valve or control valve plunger stuck.	b. Overhaul direction control valve (paras. 6-181 through 6-188).
6. Slow operation of hydraulic system.	a. Defective hydraulic pump.	a. Overhaul hydraulic pump (paras. 6-171 through 6-177).
	b. Pump rpm too low.	b. Check pump motor operation. Overhaul pump motor if required (paras. 6-208 through 6-211).
	c. Improper operation of direction control valve due to defective parts or foreign matter.	c. Overhaul direction control valve (paras. 6-181 through 6-188).
	d. Worn or scored hoist cylinder packings.	d. Overhaul hoist cylinder (paras. 6-196 through 6-200).
7. Jerky operation of hydraulic system.	a. Hoist cylinder misaligned due to distortion or deformation of mast assembly.	a. Overhaul mast assembly.
8. Noisy operation of hydraulic system.	a. Defective hydraulic pump.	a. Overhaul hydraulic pump (paras. 6-171 through 6-177).
	b. Chattering relief valve in direction control valve.	b. Overhaul direction control valve (paras. 6-181 through 6-188).
9. Speed of operation slows down after usage.	a. Defective hydraulic pump.	a. Overhaul hydraulic pump (paras 6-171 through 6-177).

TABLE 6-2. TROUBLESHOOTING (Cont'd)

Hydraulic (Cont'd)		
9. Speed of operation slows down after usage. (Cont'd)	b. Defective direction control valve.	b. Overhaul direction control valve (paras. 6-181 through 6-188).
10. Oil heats up rapidly.	a. Defective direction control valve.	a. Overhaul direction control valve (paras. 6-182 through 6-188).
	b. Defective hydraulic pump.	b. Overhaul hydraulic pump (paras 6-171 through 6-177).
11. Hoist cylinder packing leaks.	a. Worn packings.	a. Overhaul hoist cylinder (paras. 6-195 through 6-200).
	b. Piston scored.	b. Overhaul hoist cylinder (paras 6-195 through 6-200).
12. Hoist or tilt cylinder lowers or tilts while truck is idle.	a. Worn packing in hoist cylinder or tilt cylinder.	a. Overhaul hoist cylinder (paras. 6-195 through 6-200), or tilt cylinder (paras. 6-189 through 6-194).
	b. Defective hydraulic direction control valve.	b. Overhaul hydraulic direction control valve (paras. 6-182 through 6-188).
13. Mast will not tilt.	a. Defective hydraulic pump.	a. Overhaul hydraulic pump (paras. 6-171 through 6-177).
	b. Defective direction control valve.	b. Overhaul direction control valve (paras. 6-182 through 6-188).
	c. Defective tilt cylinder.	c. Overhaul tilt cylinder (paras. 6-189 through 6-194)
Forward and Reverse Travel Noise		
1. Axle noise while under power or while coasting.	a. Defective gears or bearings in drive axle.	a. Overhaul drive axle (paras 6-107 through 6-118).
	b. Brake shoe retainer defective.	b. Overhaul brake system (paras. 6-132 through 6-137).

TABLE 6-2. TROUBLESHOOTING (Cont'd)

Symptom	Probable Cause	Corrective Action
Forward and Reverse Travel Noise Cont'd)		
2. Adapter noise while under power or coasting.	a. Defective gear or pinion in adapter.	a. Overhaul adapter (paras. 6-107 through 6-118).
	b. Defective bearing in adapter.	b. Overhaul adapter (paras. 6-107 through 6-118).

3. Disconnect one terminal, and momentarily connect ohmmeter, set to 10K resistance range, across terminals. Meter Needle will rapidly increase towards zero, then gradually increase towards infinity reading if capacitor is good. If meter indicates zero resistance, or fails to swing towards zero, capacitor is defective and must be replaced.

6-17. TESTING RESISTOR-CAPACITOR SUPPRESSOR (1SP and 2SP). Use ohmmeter set to RX100K ohm scale, and connect across suppressor section. Meter will swing (kick) up-scale towards zero then slowly swing towards infinity. If meter does not respond, or indicates zero resistance, suppressor is defective and must be replaced.

6-18. TESTING RESISTOR-DIODE SUPPRESSOR (3SP). Use ohmmeter set to RX1K range, and connect meter across suppressor section. Meter will indicate less than 2,000 ohms in one direction, and near infinity in the other direction on good suppressor. If not, suppressor is defective and must be replaced.

6-19. TESTING ZENER DIODE-DIODE SUPPRESSOR (3SP and 4SP). Ohmmeter connected across suppressor will indicate near infinity resistance in both directions on good suppressor. If not, suppressor is defective and must be replaced.

6-20. TESTING SPEED CONTROL POTENTIOMETER. Disconnect connector from accelerator control, and proceed as follows:

1. Connect ohmmeter to plug wires 27 and 28. With accelerator pedal up reading will be 15 ohms or less.

2. Depress accelerator slowly. Resistance will increase smoothly to a final value between 1350 and 1650 ohms.

3. Connect ohmmeter to plug wires 28 and 29. With accelerator pedal up, reading will be between 1350 and 1650 ohms.

4. Depress accelerator pedal slowly. Resistance will decrease smoothly to approximately 15 ohms.

5. If proper resistance measurements are not obtained, loosen set screw and adjust to obtain above measurements.

6. If ohmmeter measurements are erratic or jerky, potentiometer is defective and must be replaced.

TABLE 6-3. RECOMMENDED EQUIPMENT

Name	Manufacturer or Type
VOM (volt-ohm-milliameter)	Simpson or trippett 20,000 ohm/ volt portable meter.
Earphone	Similar to those used with transistor radios.
Socket Wrench Set	Sizes to 3/4 inch.
Torque Wrench	150-pound inches.
Continuity Test Light	3-volt test light.
Heat Transfer Compound	Dow Corning no. 340 or equivalent.
Resistor	500 ohm 1/4 or 1/2-watt.

6-21. TESTING CONTROL PACK (1CP).

To test for gate pulses, proceed as follows:

1. Disconnect battery connector.
2. Connect earphone across terminals 1 and 2.
3. Connect battery connector.
4. Operate directional switch and listen for audible gate pulses in earphone.
5. If gate pulses are not heard, replace control pack.

6-22. REMOVAL AND INSTALLATION OF MAJOR COMPONENTS AND AUXILIARIES.

6-23. GENERAL. This section contains detailed instructions for removal and installation of assemblies and auxiliaries of the fork lift truck. Each assembly is covered individually with its component subassemblies as a related series of instructions. Always tag or in some other manner, identify such parts as hoses and wiring leads to facilitate reassembly. When possible, replace attaching parts such as nuts, bolts, flat washers, lockwashers and clamps on the part they attach. This should prevent loss or misplacement.

WARNING

Disconnect battery charging connector by pulling connector lever up and pulling receptacle off before performing any maintenance operations, except when battery power is required to support maintenance functions performed on installed equipment.

6-24. SEAT ASSEMBLY.

a. Removal. Tilt seat forward, remove hinge pin (31, figure 7-28) from rail and remove seat assembly from truck.

b. Disassembly. Remove two nuts (3), screws (2) and washers (4) securing seat backrest (1, figure 7-27) to frame and remove backrest.

c. Repair. Repair slightly damaged (torn) upholstery material in accordance with good commercial practice, by sewing or the application of an adhesive patch. If wear or damage is extensive, replace backrest or seat cushion.

d. Assembly. Reverse disassembly procedure of b. above.

e. Installation. Reverse procedure in a. above. Adjust seat position as desired for operator convenience.

6-25. OVERHEAD GUARD.

a. Removal.

(1) Loosen two set screws and nuts securing overhead guard (6, figure 7-38) to each side at front of truck.

(2) Remove four nuts, two flat washers and four lock washers securing overhead guard to each side of cowl at rear of truck.

(3) Using suitable hoisting equipment, remove overhead guard from truck.

b. Installation. Reverse procedure in a. above.

6-26. BATTERY COMPARTMENT COVERS.

a. Removal.

(1) Tilt seat assembly full forward and fully raise battery compartment top cover (7, figure 7-38) releasing battery compartment side covers.

(2) Open side covers (8) and lower top cover (7).

(3) Remove six screws and washers securing each cover to truck and remove covers.

b. Installation. Reverse procedure in a. above.

6-27. FLOOR PLATE.

a. Removal.

(1) Disengage accelerator pedal from accelerator rod by pulling pedal upward.

(2) Remove four screws and eight washers securing floor plate (16, figure 7-38) to frame and remove floor plate from truck.

b. Installation. Reverse procedure in a. above.

6-28. CONTROL PANEL COVER.

a. Removal. Remove eight screws and lockwashers securing control panel cover (10, figure 7-38) to truck and remove from truck.

b. Installation. Reverse procedure in a. above. Replace cover mounting gasket if it is damaged to prevent dust, dirt and other contaminants from entering control panel compartment.

6-29. FUSE ACCESS COVER.

a. Removal. Remove six screws and lockwashers securing fuse access cover (9, figure 7-38) to control panel cover and remove fuse access cover from truck.

b. Installation. Reverse procedure in a. above.

6-30. VALVE COVER.

a. Removal. Remove six screws, flatwashers and lockwashers securing valve cover to frame (15, figure 7-38) and remove valve cover from truck.

b. Installation. Reverse procedure in a. above.

6-31. LOAD BACKREST.

a. Removal. Hoist load backrest (6, figures 7-23 and 7-25) to disengage from carriage and remove from truck.

b. Installation. Reverse procedure in a. above.

6-32. FORKS.

a. Removal. Fully lower carriage, pull handle (2, figures 7-23 and 7-25) fork (1) and disengage fork from carriage. Repeat with other fork.

b. Installation. Reverse procedure in a. above positioning forks in desired locations on carriage.

6-33. CHAIN ASSEMBLIES.

a. Dual Mast Assembly Adjustment. Lift chain adjustment is provided at top of outer hoist cylinder. Lower carriage until hoist cylinder bottoms. Adjust chain adjusting nuts (30, 31, figure 7-23) until slack is removed and chains are taut.

CAUTION

Be certain load is shared equally by both chains, otherwise first chain to begin lifting will cock mast and cause rapid wear and damage to hoist cylinder.

b. Dual Mast Assembly Removal.

(1) Lower carriage until hoist cylinder bottoms.

(2) Remove adjusting nuts (30, 31, figure 7-23) securing chain to outer cylinder.

(3) Remove pin and bottom chain link from rear of carriage (60).

(4) Remove chain assembly from truck by reeving over rollers.

(5) Repeat steps (1) through (4) for opposite chain assembly.

c. Dual Mast Assembly Repair. Chain repair is limited to replacing damaged links.

(1) With chain removed from truck, use a chain breaking tool and remove damaged link or links from chain. Failure of one link may damage adjacent links. Remove all damaged links.

(2) Install replacement link and rivet pin end to secure side plates of chain.

NOTE

Plates of end links are secured by cotter pins. Do not rivet or peen these pins.

d. Dual Mast Assembly Installation.

(1) Insert link in end of chain and into brackets carriage assembly. Secure link with cotter pins in ends.

(2) Reeve chains over rollers.

(3) Secure other end of chain to chain anchor wi cotter pin through link ends (29, figure 7-23).

(4) Secure chain anchors to outer cylinder wit adjustment nuts and adjust chain tension (para. a. above

e. Triple Mast Assembly Adjustment. Lift chai adjustments are provided at base of inner channel (48 figure 7-25). Lower carriage until hoist cylinder bottoms Adjust chain adjusting nuts until slack is removed and chains are taut.

CAUTION

Be certain load is shared equally by both sets of chains, otherwise first chain to begin lifting will cock mast and cause rapid wear and damage to hoist cylinder.

f. Triple Mast Assembly Removal.

(1) Lower carriage until hoist cylinder bottoms.

(2) Loosen nuts (16, figure 7-25) and remove bolt (15) securing chains to anchor of inner upright.

(3) Remove pins and bottom chain link from rear of carriage.

(4) Remove chain assemblies from truck by reeving over rollers.

(5) Repeat steps (1) through (4) for opposite chain assemblies.

(6) Remove nut (9) from chain end on outer channel.

(7) Remove nut (9) from chain end on inner channel anchor.

(8) Reeve chain over roller and remove chain.

(9) Repeat for opposite chain.

g. Triple Mast Assembly Repair. Repair is limited to replacing damaged links.

(1) Remove damaged links from chain using chain breaking tool.

(2) Install replacement links and rivet pin end to secure side plates of chain.

NOTE

Plates of end links are secured by cotter pins. Do not rivet these pins.

h. Triple Mast Assembly Installation.

(1) Insert link in end of shorter chain into brackets on carriage assembly. Secure link with cotter pins in ends.

(2) Reeve chains over rollers on outer hoist cylinder.

(3) Secure other end of chains to anchor on bottom of inner mast, and adjust nut to remove chain tension (para. e.).

(4) Insert link in end of longer chain into brackets on top of inner upright. Secure link with cotter pins.

(5) Reeve chain under rollers on bottom end of hoist cylinder. Secure link with cotter pins.

(6) Secure chain anchors to anchor on inner upright with adjustment nuts and adjust chain tension (para. e.).

6-34. HANDBRAKE LEVER.

a. Removal.

(1) Fullly release handbrake lever (18) (figure 7-28) and remove screws, nuts and washers securing handbrake lever to brake lever bracket (22).

(2) Remove pin (41) from clevis (40) securing handbrake to seat and handbrake actuating lever (39) and pull handbrake lever (18) out of truck.

b. Installation. Reverse procedure in a. above, adjusting handbrake (para. 6-34) after installation.

6-35. SEAT BRAKE AND HANDBRAKE LINKAGE.

a. General. The parts shown in figure 7-28 comprise the handbrake and seat brake linkage. These parts and linkages are not subject to repair other than replacement of individual damaged parts. The parts are illustrated for general orientation, and to facilitate removal and installation that may be performed in conjunction with maintenance services.

b. Seat Brake Adjustment.

(1) Two adjustments are provided to maintain the motor brake at required efficiency. The brake shoe adjusting nuts provides the basic adjustment on which the seat actuation adjustment depends. The other is on the handbrake handle.

(2) Remove valve cover (para. 6-30) and floor plate (para. 6-27). With truck seat occupied and handbrake released, check with leaf or round feeler gauge for brake shoe lining-to-drum clearance of 0.010 inch to 0.020 inch.

(3) If required, tighten brake shoe adjusting nut to set clearance between these valves. Don't overtighten, so as brake won't drag.

(4) With loaded truck held on 15 degree incline by foot brake application, raise from operator's seat and release foot brake. If truck rolls, stop with foot brake and continue to (5) below.

(5) Tighten spring adjusting nut (33) not over two turns, and repeat (4) above to test results. Repeat until spring application of motor brake holds loaded truck on 15 degree incline.

6-36. SERVICE BRAKE.

a. Brake Adjustment. The service brakes are self-adjusting to take up play due to lining wear. The brake pedal must be adjusted for proper free pedal (para 6-37b-4).

b. Bleeding Service Brake System. The hydraulic brake system must at times be bled to expel air in the system. The need is generally indicated by springy or spongy brake pedal action. Unless special brake bleeding equipment is available, two men are required to bleed the system, one to maintain a constant supply of fluid in the master cylinder and to pump the brake pedal, the other to perform the bleeding operation.

(1) Remove filler plug from master cylinder through hole in floor plate, and fill with hydraulic brake fluid.

(2) Clean bleeder screws (22, figure 7-35) at each wheel cylinder. Remove small screws from bore of bleeder screws. Attach one end of bleeder hose to bleeder screw and place other end of hose in clean container partially filled with hydraulic brake fluid. Be sure end of hose is submerged in the hydraulic fluid.

(3) Turn bleeder screw counterclockwise three-quarters of a turn. Apply steady pressure to brake pedal. Hydraulic fluid containing air bubbles should be forced through bleeder hose into container.

(4) Maintain fluid level in master cylinder and continue to operate brake pedal until fluid flows in a steady solid stream without air bubbles. Close bleeder screw by turning it clockwise. Remove bleeder hose and replace small screw in bleeder screw.

(5) Repeat bleeding procedure at other wheel, replenishing brake fluid in master cylinder before each wheel cylinder is bled. Replace filler plug in master cylinder.

CAUTION

Hydraulic brake fluid from the brake system must not be reused.

c. Brakeshoe Removal.

(1) Remove front wheel (para. 6-76).

(2) With brake spring pliers, remove brakeshoe return spring (27, figure 7-35) and retainer spring (28). Carefully remove brakeshoes and install brake clamps on wheel cylinder to prevent pistons being pushed out of cylinder by residual pressure in brake lines.

d. Brakeshoe Installation.

(1) Reverse procedure in c.(2) above.

(2) Install front wheels (para. 6-76).

e. Service Brake Adjustment. Brake lining-to-drum clearance on the wheel brakes is self-adjusting. Each application of the brake pedal sets the automatic adjustment to compensate for brake lining wear. No further adjustment is required during the life of the brake linings. The only adjustment in the hydraulic brake system is for brake pedal free play (para. 6-37b-4).

6-37. MASTER CYLINDER.

a. Removal.

(1) Remove floor plate (para. 6-27).

(2) Remove bolt connector (28, figure 7-29) and brake line fitting (30) from front of master cylinder along with gaskets (29, 31). Take precautions to keep dirt from entering brake line.

(3) Remove nuts, lockwashers and screws (25, 26, 27, figure 7-29) attaching master cylinder to truck, and remove master cylinder. Push rod will remain connected to brake shaft and need not be removed.

b. Installation.

(1) Reverse procedures in a. above.

(2) Fill cylinder with hydraulic brake fluid.

(3) Bleed brake hydraulic system (para. 6-36b.).

(4) Loosen jamnut (15, figure 7-29) on push rod and adjust length of push rod by turning adjustment to give 1/4-inch to 5/8-inch free travel of pedal before brake application begins. Tighten jamnut to secure adjustment.

6-38. BRAKE PEDAL.

a. Removal.

(1) Remove floor plate (para. 6-27) from truck.

(2) Remove cotter pin (17, figure 7-29) and clevis pin (16) from push rod (34). Disconnect spring (5) from brake pedal.

(3) Remove screw (19), nut (20) and lockwasher (21) attaching brake pedal and remove pedal from truck.

b. Installation and Adjustment. Reverse procedures in a. above and check for proper pedal adjustment (para. 6-37b.(4).

6-39. HOURMETER.

a. Removal.

(1) Disconnect two leads at hourmeter from under instrument panel, tape ends and tag leads for identification.

(2) Remove two nuts holding hourmeter to instrument panel and lift hourmeter off panel.

b. Installation. Reverse procedures in a. above.

6-40. LIGHT SWITCH.

a. Removal.

(1) Remove nut at top of light switch and lower switch out bottom of instrument panel.

(2) Disconnect, tape and tag leads from switch.

b. Installation. Reverse procedures in a. above.

6-41. PANIC SWITCH.

a. Removal.

(1) Pull button off panic switch, unscrew knurled retaining nut at top of switch and lower switch out bottom of instrument panel.

(2) Disconnect, tape and tag leads from switch.

b. Installation. Reverse procedures in a. above.

6-42. BATTERY CONNECTOR RECEPTACLE.

a. Removal.

(1) Release battery connector and pull connector free from receptacle.

(2) Remove four screws and lockwashers securing receptacle to vehicle.

(3) Remove control panel cover (para. 6-28).

(4) Remove nuts, lockwashers and insulators securing positive (+) and negative ( ) leads at bottom of control panel.

(5) Remove clamps securing leads to bottom of vehicle and withdraw battery connector receptacle with leads attached.

b. Installation. Reverse procedure in a. above, being certain to properly secure leads with removed cable clamps to bottom of truck.

6-43. STOPLIGHT SWITCH.

a. Inspection and Test.

(1) Remove floor plate (para. 6-27).

(2) Connect a voltmeter between wires labeled 86-1 and 35 across switch (9, figure 7-29) (+ probe of meter to wire 35) and operate switch button by hand. If meter reads system voltage with button free and zero voltage with button pressed, switch is operative.

(3) With voltmeter still connected as in above, operate pedal manually. If operation of pedal does not give same results, switch position must be adjusted so brake application closes switch and brake pedal release opens switch.

b. Adjustment. Disconnect leads and loosen switch attaching nuts. Adjust switch position orientation so switch lights stoplight before braking action begins and light goes out before pedal reaches top of travel. Tighten nuts.

c. Removal.

(1) Remove floor plate (para. 6-27).

(2) Remove switch attaching screws, nuts and lockwashers and leads, and remove switch from bracket.

d. Installation. Reverse procedures (c. above) and adjust switch (b. above).

6-44. BATTERY CONNECTOR RECEPTACLE SWITCH.

a. Removal.

(1) Raise battery connector handle.

(2) Unscrew switch extension (figure 7-2) from switch.

(3) Remove nut and lockwasher securing switch to bracket and pull switch free.

(4) Disconnect, tape and tag leads from switch.

b. Installation. Reverse procedures in a. above.

6-45. HEADLIGHT.

a. Removal.

(1) Remove clamps (figure 7-2) holding conduit to outer upright.

(2) Disconnect two wires at terminals at bottom end of conduit.

(3) Remove two screws (46), nuts (47) and washers (48) attaching light to upright and remove light and conduit as an assembly.

b. Repair. Repair of headlight is confined to replacing the sealed beam lamp.

c. Installation. Reverse procedures in a. above.

6-46. STOP AND TAILLIGHT.

a. Removal.

(1) Remove four screws (51) and washers (52) (figure 7-2) attaching guard to truck. Lift guard.

(2) Remove control panel cover (para. 6-28).

(3) Disconnect stop and taillight connector (49).

(4) Remove nut and washer holding light to truck and remove light.

b. Repair. Remove lens attaching screws and lens and install new bolt. Replace lens attaching screws and lens.

c. Installation. Reverse procedures shown in a. above.

6-47. TAILLIGHT RESISTOR.

a. Removal.

(1) Remove control panel cover (para. 6-28).

(2) Disconnect and tag wires from resistor 3 RES located at lower left adjacent to contactor 1MS (figure 7-3). Remove two mounting screws and remove resistor.

b. Test. Test resistor with ohmmeter across terminals for 40 ohms resistance, plus or minus 20%.

c. Installation. Reverse procedures in a. above.

6-48. HORN.

a. Removal.

(1) Remove floor plate (para. 6-27).

(2) Disconnect wires from horn (70, figure 7-2).

(3) Remove screws (71) and washers (72) holding horn to adapter and remove horn.

b. Installation. Reverse procedures in a. above.

6-49. HORN BUTTON.

a. Removal. Remove four screws (11, figure 7-33) and lift off cover (13), button (12), separator (18), contact (17), insulator (16), spring (15) and contact (14).

b. Installation. Reverse procedures in a. above

6-50. BATTERY MAINTENANCE.

a. Checking Specific Gravity. The specific gravity of the electrolyte at 77 deg F. with electrolyte at normal level and cells fully charged should be 1.265 to 1.285.

b. Adjusting Specific Gravity. Acid or electrolyte should never be added to a cell without first being sure that charging will not restore the gravity. Charge should be continued until specific gravity when tested every hour for three hours shows no further rise at any cell. If, after charge, gravity is still below normal, proceed as follows:

(1) Put battery on charge again at the finish rate so cells gas for thorough mixing of electrolyte.

NOTE

> Never make a gravity adjustment on a cell which does not gas freely on charge.

(2) Draw off electrolyte down to splash cover from low reading cells. Slowly pour electrolyte of 1.3000 to 1.350 specific gravity in cell to high level (1/4-inch below filler neck).

CAUTION

> Never use acid of higher specific gravity than 1.350.

(3) Wait twenty minutes for added electrolyte to become thoroughly mixed by gassing charge and then read specific gravities. If the gravity of any cell is still below normal repeat steps (1) through (3). Repeat as many times as necessary.

(4) Continue charging battery for one hour at the finishing rate after gravity has been adjusted.

(5) If the corrected specific gravity of any cell is higher than normal (1.285) proceed as follows:

(6) As the battery charges, withdraw from the cell a small amount of electrolyte and replace with water. Repeat at 20 minute intervals if necessary until a 1.285 specific gravity reading is obtained.

c. Adding Water to Battery. Add only distilled water or chemically analyzed and approved water from public drinking source. The proper level of electrolyte is 1/4-inch from bottom of filler neck.

CAUTION

> Do not use water which has passed through a water softener. This water is chemically destructive to a lead-acid battery. It is not equivalent to distilled water.

(1) Add water slowly. Water should be added before charging to insure prompt mixing with the electrolyte.

(2) In sub-freezing temperatures battery must be put on finish charge for one hour after water has been added.

d. Cleaning the Battery. The entire battery and battery compartment should be kept clean and dry. If the electrolyte has been spilled or corrosion has formed on the battery, proceed as follows:

(1) Add one pound of bicarbonate of soda to one gallon of warm water. Pour solution over corrosion or spilled electrolyte.

(2) When foaming action stops, rinse off the entire battery with clear water.

CAUTION

> Vent plugs must be installed in cells to prevent soda solution from getting into the cells. Do not use steam or very hot water to clean battery.

e. Charging the Battery. Batteries normally discharged more than one-third of their capacity daily should be recharged daily. Other batteries in use should be charged at least once a week. Do not charge batteries more often than necessary to reduce gassing and water loss. Plan on recharge time for a completely discharged battery of about eight hours, less for partially discharged batteries. Charge as follows:

(1) Disconnect battery leads at battery connector receptacle and connect charger to battery half of connector.

(2) Using procedure appropriate to the charger being used, adjust initial charging rate for a fully discharged battery to 130 to 160 amperes.

(3) At end of charging time disconnect charger and observe cell vent caps for signs of excessive gassing. This is usually indicated by electrolyte around the fill hole of the cell.

6-51. WIRING HARNESS.

6-52. Repair of the wiring harness is limited to isolating shorted and open circuits and using good commercial practice in their repair. Refer to the wiring diagram (figure 4-2) and conduct a systematic inspection using an ohmmeter to isolate the trouble. Remedy the trouble by splicing leads where required and applying electrical tape to prevent short circuits from occurring.

6-53. MOTOR BRUSH REPLACEMENT.

6-54. Motor brush replacement for the travel motor (figure 7-36), power steering motor (figure 7-32) or hydraulic pump motor (figure 7-15) is the same.

a. Removal.

(1) Remove screw, nut and lockwasher securing brush covers to motor housing and remove brush covers.

(2) Remove screw and lockwasher securing brush leads.

(3) Pull back on brush spring sufficiently to release brush and pull brush out of brush holder.

(4) Repeat steps (1) through (3) for removal of remaining brushes.

b. Inspection. Compare length of used brush with length of a new brush from stock. Replace any brush worn to half (or less) the length of new brush, as given below.

c. Installation.

(1) Install new brushes in brush holders with short side of brush toward spring side of holder so brush friction surface contour mates with surface of armature commutator. If brush edge meets commutator, reverse brush in holder. Fasten brush leads to holder with removed screws and lockwashers.

(2) Hook brush springs over brushes and check pressure exerted on brush with a pull scale. Pull should be 26 ounces to 32 ounces at time scale lifts spring from brush on either motor.

(3) Install brush covers and secure in position on motor housing with removed screw, nut and lockwasher.

6-55. RELAY CONTACT REPLACEMENT.

6-56. Relay contact maintenance is restricted to those relays having contacts visible for inspection and replaceable without removing the relays. Contacts require replacement when the silver has worn down to the steel support.

a. Removal.

(1) Remove control panel cover (para. 6-28).

(2) Remove nuts holding contacts to be removed. Remove contacts from relay.

b. Installation. Put new contacts in position and install nuts. No special check or adjustment is needed after installation.

6-57. FUSE AND FUSETRON REPLACEMENT.

a. Removal.

(1) Remove fuse access cover (para. 6-29).

(2) Loosen screws securing fusetron to fuse panel and slide fusetron off fuse panel.

(3) Pull fuses straight off fuse panel.

b. Installation. Reverse applicable procedures in a. above to replace fusetrons and fuses.

6-58. DIRECTIONAL CONTROL SWITCH.

6-59. Maintenance of the directional control switch (figure 7-12) consists of replacing internal switches. The switch need not be removed.

a. Removal.

(1) Remove cover attaching screws (12) and washers (13) and remove cover (11).

(2) Disconnect and tag leads from switch terminals (18).

(3) Remove switch attaching screws and nuts and remove switch.

b. Installation. Reverse procedure in a. above.

6-60. PUMP MOTOR SWITCH.

a. Removal.

(1) Remove valve cover (para. 6-30).

(2) Disconnect and tag leads at switch (60, figure 7-2) loosen jamnut and screw switch out of switch bracket.

b. Installation. Reverse procedures in a. above, turning switch in switch bracket to point where switch is actuated when either the tilt or hoist lever is operated. Lock with jamnut.

6-61. SEAT SWITCH.

a. Removal.

(1) Remove valve cover (para. 6-30).

(2) Disconnect and tag leads at switch (60, figure 7-2).

(3) Remove switch attaching screws, nuts and lockwashers securing switch to bracket and remove switch.

b. Installation. Reverse procedures in a. above, adjusting switch position up or down as required so that it is just actuated as the operator's seat is fully lowered. Loosen bracket screws to position bracket with attached switch for proper actuation and then tighten bracket screws.

6-62. THERMAL RELAY.

6-63. Each motor is protected by a thermal relay which will open the motor circuit if overheating occurs. When temperature sensed by the relay drops to a safe operating value, the relay will automatically close.

a. Removal.

(1) Remove nut, lockwasher and clamp (figure 7-2) which fastens relay to motor and lift relay from motor.

(2) Scrap sealing compound from relay terminals. Unsolder leads at terminals.

b. Installation. Reverse procedures in a. above, soldering leads to terminals with rosin flux and solder. Avoid unnecessary heating of the relay while soldering. Coat terminals after soldering with silicone rubber sealing compound.

c. Test.

(1) Test electrical continuity of relay between terminals with an ohmmeter or test light. Test at room temperature.

(2) If controlled temperature is available, test opening temperature of relay. It should open on rising temperature at 224 degrees F. plus or minus 4 degrees.

6-64. ACCELERATOR CONTROL CONTACT ASSEMBLY.

a. Removal.

(1) Remove floor plate from truck (para. 6-27).

(2) Disconnect linkage ball joint (1, figure 7-11) and spring from operating lever (9).

(3) Disconnect wiring harness at connector (6).

(4) Remove screws (4) and lockwashers (5) holding mounting bracket (3) to truck and remove assembly.

(5) Remove cover screws (13), cover (12) and gasket (14).

b. Installation. Reverse procedures in a. above.

6-65. CONTROL VALVE LEVERS AND LINKAGE.

a. Removal.

(1) Remove valve cover plate (para. 6-30).

(2) Remove retaining rings (4, figure 7-20) securing connecting rods (6) to hoist (2) and tilt levers (1).

(3) Pull out cotter pin (3) securing pin (5) in bracket (13) and pull out pin to release hoist and tilt levers.

(4) Remove two screws (14), nuts (15) and lockwashers (16) securing bracket (13) to truck and remove bracket.

(5) Remove cotter pins (11) and clevis pins (12) securing clevis (10) and connecting rods to control valve. If valve actuation is proper, note position of sleeves and connecting rod clevises before disassembling them from the connecting rods.

(6) Compress spring (22) turn disc (21) to release pin (23) and remove disc, spring and pin from bracket.

(7) Remove screws (25) securing spacer clips (24); remove spacer clips.

(8) Remove screws (18), nuts (19) and lockwashers (20) securing bracket (27) and switch actuator hinge (26); remove bracket and switch actuator hinge.

b. Installation. Reverse procedure in a. above, adjusting position of sleeves (7) on connecting rods until control valve actuation is proper, then secure with setscrews (8).

6-66. TILT CYLINDERS.

a. Removal.

(1) Remove truck floor plate (para. 6-27).

(2) Tag and disconnect hoses (2, 3, 4, 5, figure 7-13) from tilt cylinders. Cap hoses and plug ports in cylinders (18, 19) to exclude dirt.

(3) Support mast so it will not suddenly tilt on removal of tilt cylinders.

WARNING

If not supported the mast will fall forward when the tilt cylinders are disconnected.

(4) Remove screws (22) attaching pins to brackets on truck frame and on uprights.

(5) Pull or drive pins (20, 21) from cylinder ends. Be careful not to let cylinder fall as pins are removed.

b. Installation.

(1) Position tilt cylinder (back end) in U-shaped bracket on truck frame.

(2) Align bracket holes and cylinder end hole. Secure pin with screw.

(3) Remove plugs from ports and caps from hoses and connect hydraulic hoses to cylinders.

(4) Check hydraulic fluid level in reservoir (para 5-10).

(5) After installation, operate tilt control lever several times to purge air from cylinders. Check cylinders and hose fittings for leakage while operating.

(6) Secure front end of tilt cylinders to upright brackets with pins and attaching screws.

6-67. HYDRAULIC FILTER CARTRIDGES.

6-68. Two filters are used in the hydraulic system; one in suction line adjacent to pump, the other in return line from control valve at left rear of hydraulic tank.

a. Return Filter Cartridge Replacement.

(1) Unscrew cartridge filter element (7, figure 7-21) from filter head (8).

(2) Install new cartridge by reversing procedure in (1) above. Wet sealing ring with clean hydraulic oil and tighten hand-tight.

b. Suction Filter Element Replacement.

(1) Unscrew filter housing (1, figure 7-19) from head (5) and discard housing seal (2).

(2) Remove and discard filter element (3) and element seat (4).

(3) Install new filter element and seals by reversing procedures (1) and (2) above

6-69. HOIST REGULATING VALVE (Dual Mast Truck).

a. Removal.

(1) Fully lower lift carriage.

(2) While working from front of truck, unscrew hose from hoist regulating valve elbow (7, figure 7-23) and cap to exclude dirt.

(3) Unscrew hoist regulating valve (8) with attached fittings from hoist cylinder and remove fittings. Discard O-ring packings.

b. Installation. Reverse procedures in a. above using new O-ring packing. Operate hoist control valve several times to purge air and check for hydraulic fluid leakage at fittings. Tighten as required.

6-70. STEERING WHEEL.

a. Removal.

(1) Remove horn button (para. 6-49).

(2) Remove steering wheel nut (20, figure 7-33) and using a suitable puller, remove steering wheel (19) from steering gear column.

b. Installation. Reverse procedures in a. above orienting steering wheel on steering gear column so that keyway properly mates with key before securing steering wheel with nut.

6-71. STEERING GEAR.

a. Lash Adjustment.

(1) Remove nut holding drag link tie rod end (5, figure 7-30) to pitman arm and disconnect drag link.

NOTE

If necessary, use puller but do not damage threads or place strain on pitman arm.

(2) Remove horn button (para 6-49).

(3) Adjust steering gear lash (para 6-168).

b. Steering Linkage Adjustment.

(1) With steering wheel halfway between extreme right and extreme left turn, assemble pitman arm (22, figure 7-33) to steering gear in vertical position.

(2) With trailing axle wheels in straight ahead position, adjust drag link (7, figure 7-30) to proper length by loosening clamps (6) and turning drag link tubing until tie rod end at front of drag link will enter hole in pitman arm freely, with pitman arm vertical.

(3) Tighten drag link clamps (6).

6-72. WHEEL ALIGNMENT MEASUREMENT. Determine if wheel alignment adjustment is needed as follows.

a. With rear axle level front to rear, and wheels in straight ahead position, measure inside span between tires at hub height at front of axle. Mark point of measurement.

b. Roll truck until rear wheel rotates one-half revolution. Measure between same points except this time at rear of axle.

c. If measurements obtained in a. and b. above differ by over 1/16-inch, adjust as below until wheels are parallel to within 1/16-inch as measured in a. and b. above.

6-73. WHEEL ALIGNMENT ADJUSTMENT.

a. Loosen (but do not remove) screws and nuts from all tie rod end clamps (figure 7-34).

b. Turn each tie rod an equal number of turns in the direction necessary to change toe-in as required.

NOTE

Each tie rod has right hand threads at one end, left hand threads at the other so adjustment can be made to change effective length without dismounting tie rod.

c. When adjustment has been completed, tighten tie rod clamp screws and nuts and recheck wheel alignment measurement (para 6-72).

6-74. REAR WHEELS.

a. Removal.

(1) Lower forks fully and tilt mast back. Raise rear of truck until wheels clear floor.

(2) Remove cap (5, figure 7-34) and remove cotter pin (7), nut (8), and washer (9) from bore of wheel.

(3) Draw wheel from steering axle spindle. Because of manufacturing tolerances the cone and rollers of the inboard bearing may remain with spindle. If so, it can easily be removed. Avoid damaging oil seal, if possible, when removing wheel.

b. Installation. Reverse procedures in a. above, tightening wheel nut snug, then backing it off not more than 1/6 turn, and install cotter pin.

6-75. REAR WHEEL BEARINGS.

a. Removal.

(1) Remove rear wheels (para 6-74).

(2) Pull bearing cups (10, figure 7-34) from bore of wheel. A suitable bearing puller may be used to pull bearings from wheel if they stick in bore.

b. Service.

(1) Clean bearings with SD and dry thoroughly.

NOTE

Do not use compressed air and spin dry.

(2) Inspect cups and rollers for wear or failure. Inspect cone and roller assemblies for roughness when rotated.

(3) If bearings are serviceable, repack with grease, using a bearing packing device, if available.

NOTE

Replace cups and cones as sets do not use old cone in new cup or new cone in old cup.

c. Installation. Reverse procedures in a. above except press bearing cups into wheel fully before installing wheel.

6-76. DRIVE AXLE WHEELS.

a. Removal.

(1) Jack up front wheels as follows:

(a) Tilt mast to extreme back position.

(b) Place block directly under mast at lift cylinder.

(c) Tilt mast forward until wheels are clear.

(2) Remove 12 nuts (12, figure 7-35), washers (13) and bushings (14) holding wheel and brake drum (11) to truck.

(3) Remove wheel.

NOTE

If brake lining drags on wheel, interfering with removal, slack off adjustment of brake adjusters by vigorously wiggling wheel to force brakeshoes inward. If wheel still will not come off, release brake adjusters by reversing brake adjustment procedure (para 6-36) until brake shoes are fully retracted.

b. Installation. Reverse procedures in a. above.

c. Adjust service brakes (para 6-36).

6-77. HOIST CYLINDER. (Dual Mast Assembly Truck)

a. Removal.

(1) Fully lower upright assembly.

(2) Remove load backrest from carriage (para 6-31).

(3) Remove chain assembly (para 6-33b.)

(4) Disconnect hose at hoist cylinder elbow (7, figure 7-23) and plug to prevent entrance of dirt.

(5) Remove four screws (15) lockwashers (16) retainers (13, 14) securing hoist cylinder to crosshead.

(6) Slide hoist cylinder from uprights, being careful not to lose pivot ball (47).

b. Installation. Reverse procedure of a. above, and purge air from hydraulic system.

6-78. HOIST ASSEMBLY (Triple Mast Assembly Truck)

a. Removal.

(1) Fully lower upright assembly.

(2) Remove load backrest from carriage (para 6-31).

(3) Remove chain assembly (para 6-33f.)

(4) Disconnect hose at adapter (24, figure 7-25) from base of cylinder.

(5) Remove screw (46) and spacer (47) from top to cylinder.

(6) Slide hoist cylinder from uprights.

b. Installation. Reverse procedure of a. above, and purge air from hydraulic system.

6-79. DUAL MAST ASSEMBLY.

a. Removal. Removal of the complete mast is required when removing the drive axle. In most cases the mast can be maintained by removal and replacement of its individual components. Remove complete mast as follows:

(1) Slide backrest from carriage and lift from truck (para 6-31).

(2) Remove forks from truck (para 6-32).

(3) Attach a hoist to assembly and relieve the weight of the assembly on its supporting parts. Arrange to brace the mast against tipping as disconnections are made.

(4) Disconnect hose at hoist cylinder fitting (7, figure 7-23) and plug hose to prevent entrance of dirt.

(5) Disconnect headlight at uprights (para 6-45).

(6) Disconnect both tilt cylinders at uprights by removing pivot pins and attaching screws (para 6-66).

(7) Remove bearing caps holding mast to axle each attached with two screws and lockwashers. Hoist mast from truck and lay it on floor for disassembly.

b. Installation. Reverse procedure in paragraph above.

6-80. TRIPLE MAST ASSEMBLY.

a. Removal.

(1) Slide backrest from carriage and lift from truck (para 6-30).

(2) Remove forks from truck (para 6-32).

(3) Attach a hoist to assembly to relieve weight.

(4) Disconnect hose at cylinder adapter (24, figure 7-25).

(5) Disconnect headlight at uprights (para 6-45).

(6) Disconnect tilt cylinders at uprights (para 6-66).

(7) Remove bearing caps holding mast to axle, each attached with two screws and lockwashers. Hoist from truck and lay on floor for disassembly.

b. Replacement. Reverse procedure in a. above.

6-81. CONTROL VALVE.

a. Removal.

(1) Disconnect control valve linkage at control valve (para 6-65).

(2) Tag hoses for identification and disconnect from control valve (40, figure 7-20). Cap or plug hose ends and valve ports to prevent entrance of dirt.

(3) Remove three screws (41), nuts (42), and lockwashers (43) securing control valve (40) to truck body and remove control valve. Screws are removed from battery compartment side.

b. Installation.

(1) Install three control valve mounting screws through truck body from battery compartment side and mount control valve on screws. Secure with removed nuts and lockwashers.

(2) Reinstall removed hoses according to tags attached at removal. Be certain hoses are tight.

(3) Attach control valve linkage to control valve (para 6-65).

(4) Operate system while gradually increasing loads to check for proper operation and hydraulic fluid leakage.

6-82. HYDRAULIC OIL TANK.

a. Removal.

(1) Drain hydraulic oil tank through plug (6, figure 7-18).

(2) Remove valve cover (para 6-30).

(3) Remove seat (para 6-24).

(4) Remove floor plate (para 6-27).

(5) Loosen hose clamp (14, figure 7-13) and disconnect hoses (13) at hydraulic tank.

(6) Remove four screws (12, figure 7-18) and washers (14, 15) and nuts (13) securing hydraulic tank (11) to truck body and lift hydraulic tank from truck.

b. Installation.

(1) Position hydraulic tank on truck body and secure with four screws, nuts and washers.

(2) Screw filters on hydraulic tank.

(3) Install return hose to filter fitting and tighten hose clamp securely.

(4) Install suction hose to bottom of hydraulic tank and tighten hose clamp securely.

(5) Position seat on hydraulic tank and secure with hinge pin.

(6) Fill hydraulic tank with oil and operate system to check for hydraulic fluid leakage.

(7) At completion of operational test, install cowl and floor plate.

6-83. DIRECTIONAL CONTROL SWITCH.

a. Removal.

(1) Remove directional control switch cover (11, figure 7-12) and tag and disconnect internal electrical lead.

(2) Remove return to neutral cable by loosening attaching connector (9, figure 7-28).

(3) Remove four screws (5, figure 7-12) securing directional control switch and clamp (4) to steering gear column and remove clamp.

(4) Unscrew directional control switch off conduit coupling (3) and remove from truck.

b. Installation.

(1) Install directional control switch on conduit coupling with lever oriented to right of steering gear column.

(2) Secure switch to steering gear column with clamp and four screws.

(3) Secure return to neutral cable to switch with attaching connector, adjusted so that with no pressure on operator's seat, switch returns to neutral from either the forward or reverse positions.

(4) Reinstall electrical leads to switch according to tags attached at removal and attach switch cover.

6-84. STEERING GEAR.

a. Removal.

(1) Remove floor plate (para 6-27).

(2) Remove directional control switch (para 6-83).

(3) Remove cover (6, figure 7-33) mounted on steerin gear column secured with two screws housing horn lead and disconnect and tag horn leads at connector.

(4) Disconnect drag link at steering gear arm (7, figur 7-30).

(5) Disconnect power steering hose connection (8, 11, figure 7-30) from steering gear housing (97, figure 7-33) cover hose connections to prevent entrance of dirt.

(6) Remove four screws (3, 4, figure 7-33) and lockwashers (5) securing steering gear housing (97) to truck body.

(7) Support steering gear and remove clamp securin steering gear to instrument panel by removing attachin nuts and lockwashers. Pull steering gear out of truck.

b. Installation.

(1) Reverse procedure in paragraph a. above.

6-85. HYDRAULIC STEERING PUMP.

a. Removal.

(1) Remove floor plate (para 6-27).

(2) Disconnect hoses (9, 11) from hydraulic pump (18, figure 7-30). Cap ends to prevent entrance of dirt.

(3) Remove two screws and lockwashers securing hydraulic steering pump to hydraulic steering pump motor and remove hydraulic pump.

b. Installation.

(1) Position hydraulic steering pump on pump motor, and secure in place with two screws and lockwashers.

(2) Securely connect outlet hose and inlet hose to hydraulic pump. Operate hydraulic steering system and check for fluid leakage.

(3) Install floor plate.

6-86. HYDRAULIC STEERING PUMP MOTOR.

a. Removal.

(1) Raise truck off floor.

(2) Remove seven screws mounting travel motor cover (13, figure 7-38) on truck frame.

(3) Remove hydraulic steering pump from motor (para 6-85).

(4) Slide protective rubber elbows up electrical leads and disconnect and tag leads from motor terminals.

(5) Remove screw and lockwasher securing thermal relay (38, figure 7-2) to motor housing.

(6) While supporting motor (22, figure 7-30) remove four screws, nuts and lockwashers securing motor mounting bracket to truck body and remove motor from under truck.

b. Installation.

(1) Working from under truck, position hydraulic steering pump motor on body and secure motor mounting bracket to body with four screws, nuts and lockwashers.

(2) Connect thermal relay to motor housing with screw and lockwasher.

(3) Secure electrical leads to terminals tagged at removal and push protective rubber elbows over terminals.

(4) Connect hydraulic pump to hydraulic pump motor with two screws and lockwashers.

(5) Install truck travel motor cover.

6-87. HYDRAULIC PUMP.

a. Removal.

1. Remove floor plate (para 6-27).

(2) Disconnect hoses inlet elbow (3, figure 7-14) and outlet (1) from pump (8) and cap ends to prevent entrance of dirt.

(3) Remove two nuts (9) and lockwashers (10) securing pump to motor and remove pump with attached coupling half (11).

b. Installation. Reverse procedure in a. above, making sure coupling halves engage.

6-88. HYDRAULIC PUMP MOTOR.

a. Removal.

(1) Raise truck off floor.

(2) Remove travel motor cover from under truck.

(3) Remove hydraulic pump (para 6-87).

(4) Remove tee bolt, nut and washers securing hydraulic pump moter to strap, and lower motor.

(5) Slide protective rubber elbows up electrical leads and disconnect and tag leads from motor terminals.

(6) Remove screw and lockwasher securing thermal relay (38, figure 7-2) to motor housing.

b. Installation. Reverse procedure in paragraph a. above.

6-89. STEERING AXLE.

a. Removal.

(1) Tilt mast back. Lift rear of truck high enough to provide enough space in which to work. Block truck so it cannot fall after being raised.

(2) Disconnect tie rod end (15, figure 7-34) from bellcrank lever (38).

(3) If rear axle is raised from ground, support it against falling when attaching parts are removed. Remove four screws (2, figure 7-34) and lockwashers (3) from retainer plate (1) and remove retainer plate.

(4) Lower axle, or hoist truck to get clearance and roll axle from beneath truck.

b. Installation.

(1) Roll axle under jacked up truck and jack up axle until axle blocks enter recesses in truck body.

(2) Install retainer plate on truck body to secure steering axle in position and secure retainer bar with four screws and lockwashers.

(3) Connect drag link lever to tie rod end.

(4) Remove support and lower truck to floor.

(5) Adjust tie rods and steering linkage as required (para 6-73).

6-90. DRIVE AXLE, ADAPTER AND TRAVEL MOTOR.

a. Removal.

(1) Remove entire mast assembly including carriage, forks and lift cylinder as a unit (para 6-79 or 6-80).

(2) Disconnect and remove brake line from master cylinder at tee fitting (29, figure 7-13) on drive axle. Protect line against kinking or entry of dirt while disconnected.

(3) Remove floor plate (para 6-27) and remove thermal relay from travel motor. Remove horn (70, figure 7-2) attached to adapter. Disconnect rod (8, figure 7-36) brake on rear of motor. Drain lubricant from axle and adapter.

(4) Remove bottom plate from under truck. Support travel motor from below with wheeled dolly or floor jack. Disconnect and tag four leads from terminals of travel motor.

(5) Remove six screws (5, figure 7-35) nuts (6) and washers (7) securing motor to mounting bracket. Remove four bolts, lockwashers and two bearing brackets securing axle to frame. Lift front end of truck from axle and draw axle, adapter and travel motor from under truck.

(6) Remove nine screws (9, 10, figure 7-37), lockwashers (11) and two nuts (8) attaching adapter to axle and take motor and adapter, as a unit, from axle.

(7) Remove six screws (3, figure 7-35) and lockwashers (4) attaching adapter to motor and draw motor (2) from adapter (8).

b. Installation.

(1) Place gasket between travel motor and adapter, align holes and secure motor to adapter with screws and lockwashers.

(2) Place gasket (12, figure 7-37) between drive axle and adapter, align holes and gears and secure with screws, nut and lockwashers.

(3) Position drive unit on a wheeled dolly and roll unit under raised front end of truck. Lower front end of truck until axle aligns with bearing bracket halves on frame and travel motor mounting flange holes align with holes in mounting brackets. Secure axle with bearing brackets, screws and lockwashers and travel motor with screws, nuts and washers.

(4) Secure hydraulic tee fitting to adapter.

(5) Attach tagged electrical leads to travel motor terminals. Secure protective cover to underside of truck.

(6) Lubricate drive axle and adapter. Connect rod and cable at brake on rear of travel motor. Install thermal relay on travel motor. Attach horn to adapter. Replace floor plate.

(7) Install mast assembly on truck.

(8) Bleed hydraulic brake system through each wheel cylinder (para 6-36b.).

6-91. FUSE HOLDER.

a. Removal.

(1) Remove cover from control panel compartment (para 6-28).

(2) Disconnect and tag all electrical lead wires from fuse holders (7, 8, figure 7-3).

(3) Remove two screws which secure each fuse holder to fuse panel and withdraw fuse holder.

b. Installation.

(1) Align mounting holes in fuse holder with hol fuse panel and secure fuse holder with screws.

(2) Reconnect leads (disconnected during disassem to screw-type fuse terminals.

(3) Reinstall cover.

6-92. PUMP MOTOR AND MASTER SWITCH RELA

a. Removal.

(1) Remove cover from control panel compartm (para 6-28).

(2) Remove four cap screws and lockwashers wh secure base of each relay (1 and 2, figure 7-3) to mount panel; then, withdraw relay for access to terminals.

(3) Disconnect and tag all leads removed from relay.

(4) Withdraw relay from compartment.

b. Installation.

(1) Connect all leads to relay terminals.

(2) Align mounting holes in relay base with holes mounting panel and secure relay in place with screw lockwashers and flat washers.

6-93. STEERING RELAY (1S).

a. Removal.

(1) Remove cover from control panel compartme (para 6-28).

(2) Remove three screws which secure base of steeri relay (15, figure 7-3) to mounting panel. Withdraw rel slightly from panel for access to terminals.

(3) Disconnect and tag all leads from steering relay.

(4) Withdraw steering relay from compartment.

b. Installation.

(1) Connect all leads to relay.

(2) Align holes in base of relay with tapped holes mounting panel and secure relay to panel with screws.

(3) Reinstall cover on control panel compartment.

6-94. SHORTING CONTACTOR, FORWARD, REVERS AND FIELD WEAKENING RELAYS.

a. Removal.

(1) Remove cover from control panel compartme (para 6-28).

(2) Remove three machine screws which secure each relay (17, 18, or 19, figure 7-3) to mounting panel. Withdraw relay from mounting panel slightly for access to terminals.

(3) Disconnect and tag all leads to relay.

(4) Withdraw relay from control panel compartment.

b. Installation.

(1) Connect all leads to relay.

(2) Align mounting holes of relay with tapped holes in mounting panel and secure relay to panel with screws, lockwashers and flat washers.

(3) Reinstall cover on control panel compartment.

6-95. CONTROL PACK (2CP).

a. Removal.

(1) Remove cover from control panel compartment (para 6-28).

(2) Disconnect connector 4PL.

(3) Remove four machine screws and washers which secure control pack (22, figure 7-3) to mounting panel.

(4) Withdraw control pack from control panel compartment.

b. Installation.

(1) Align mounting holes of pack with tapped holes in mounting panel and secure pack with washers and screws.

(2) Connect pendant cable connector 4PL.

(3) Reinstall cover on control panel compartment.

6-96. FIELD WEAKENING RESISTOR (FW).

a. Removal.

(1) Remove cover from control panel compartment (para 6-28).

(2) Disconnect and tag all lead wires to FW RESISTOR (21, figure 7-3).

(3) Remove two mounting nuts, flat washers and lockwashers, and remove resistor.

b. Installation. Reverse procedure in paragraph a. above.

6-97. ENGINE HOUR PACK (EHP).

a. Removal.

(1) Remove cover from control panel compartment (para 6-28).

(2) Disconnect and tag all leads on pack (10, figure 7-3).

(3) Remove two mounting screws and remove pack.

b. Installation. Reverse procedure in paragraph a. above.

6-98. SUPPRESSOR 3SP AND 4SP.

a. Removal.

(1) Remove cover from control panel compartment (para 6-28).

(2) Disconnect and tag all electrical leads on suppressor condenser 3SP (14, figure 7-3) or suppressor condenser 4SP (11).

(3) Remove two mounting screws and remove suppressor.

b. Installation. Reverse procedure in paragraph a. above.

6-99. FIELD WEAKENING PACK (FWP).

a. Removal.

(1) Remove cover from control panel compartment (para 6-28).

(2) Disconnect and tag all electrical leads on pack (20, figure 7-3).

(3) Remove two mounting screws and remove pack.

b. Installation. Reverse procedure in paragraph a. above.

c. Adjustment. See paragraph 6-240.

6-100. ANTI ROLLBACK PACK (ARP).

a. Removal.

(1) Remove cover from control panel compartment (para 6-28).

(2) Disconnect and tag all lead wires to ARP (12, figure 7-3).

(3) Remove two mounting screws and remove ARP.

b. Installation. Reverse procedure in paragraph a. above

6-101. RESISTOR 3RES.

a. Removal.

(1) Remove cover from control panel compartment (para 6-28).

(2) Disconnect and tag all lead wires to 3RES (9, figure 7-3).

(3) Remove two mounting screws and remove 3RES.

b. Installation. Reverse procedure in paragraph a. above.

6-102. CONTROL PACK 1CP.

a. Removal.

(1) Remove control panel cover (para 6-28).

(2) Disconnect and tag all electrical leads on control pack (7, figure 7-10).

(3) Remove four mounting screws and remove pack.

b. Installation. Reverse procedure in paragraph a. above.

c. Adjustment. See paragraph 6-240.

6-103. CAPACITOR 1C.

a. Removal.

(1) Remove control panel cover (para 6-28).

(2) Disconnect and tag electrical leads on capacitor (19, figure 7-10).

(3) Remove mounting brackets and remove capacitor.

b. Installation. Reverse procedure in paragraph a. above.

6-104. TRANSFORMER 1T.

a. Removal.

(1) Remove control panel cover (para 6-28).

(2) Disconnect and tag leads on transformer (18, figure 7-10).

(3) Remove two mounting screws and remove transformer.

b. Installation. Reverse procedure in paragraph a. above.

6-105. WIRING HARNESS.

a. Removal. Removal of the wiring harness (37, figure 7-2) is not ordinarily required during overhaul of the truck. Usually, repair of the harness can be accomplished with the harness in place. However, if repair is required in an inaccessible place, the harness may be removed from the truck and reinstalled as follows:

(1) Release handle on battery connector and disengage battery connector.

(2) Remove floor plate (para 6-27).

(3) Remove valve cover (para 6-30).

(4) Remove seven screws, nuts and flat washers whic secure cover to bottom of truck frame below batter compartment and withdraw cover.

(5) Disengage terminals on harness leads 99 and 13A- from terminals on wires extending from headlight flexibl conduit.

(6) Remove two terminal covers from steering colum and disconnect harness lead 83 and 84 from screw-typ horn button terminals.

(7) Disengage plug on harness (containing leads 63, 64, 65, 71, 72 and 74) from receptacle on cable extending from direction control switch.

(8) Disengage harness terminals on leads 92 and 9 from push-on terminals of panic switch.

(9) Disengage harness terminals on leads 13A-4 and 8 from screw-type terminals on light switch.

(10) Disconnect harness leads 19, 86-1, 86-2 and 9 from screw-type terminals on light switch.

(11) Disengage plug on wiring harness (containing lead 27, 28, 29, 45, 46, 70 and 71) from receptacle on cabl extending from accelerator master switch.

(12) Disengage plug on wiring harness (containing lead 35, 70, 86-1 and 94) from plug on cable extending from brake and stoplight switch.

(13) Disconnect wiring harness leads 13A-1 and 84 from screw-type terminals on horn.

(14) Disconnect wiring harness leads 91 and 92 from screw-type terminals on seat switch.

(15) Disconnect wiring harness leads 78 and 98 from screw-type terminals on pump switch.

(16) Disconnect wiring harness leads 69-1 and 93 from screw-type terminals on battery connecting switch.

(17) Remove three clamps which secure thermal relays to hydraulic oil tank to steering pump motor, to travel motor frame and to pump motor frame. After disengaging thermal relays, replace clamps to prevent loss of parts.

(18) Starting at front of truck, remove all clamps and clips which secure wiring harness branches and main trunk to structural members. After disengaging harness from clamps and clips, re-attach clamps and clips to prevent loss of parts.

(19) Remove control panel cover (para 6-28).

(20) Disengage two plugs on wiring harness from receptacles connected to internal wiring of control panel.

(21) Unscrew conduit fitting (through which wiring harness passes) from front wall of control panel compartment. Fitting is located in lower left hand corner of control panel compartment.

(22) Carefully withdraw wiring harness from control panel compartment. Straighten out branches in harness as required and work bulky items through holes and around corners as required. Avoid undue strain on plugs, terminals and thermal relays.

b. Installation. Installation of the wiring harness is essentially the reverse of the removal procedure. Plugs are keyed to prevent improper orientation. After securing harness with clips and clamps, assure that sufficient clearance is maintained between harness and all moving parts. Hand form harness where required to obtain clearance. Apply silicone rubber to exposed screw-type terminals on seat switch, pump motor switch and on brake stoplight switch. Insulate other exposed terminals with vinyl tubing.

6-106. OVERHAUL OF MAJOR COMPONENTS AND AUXILIARIES.

6-107. DRIVE AXLE AND ADAPTER.

6-108. The adapter provides a gear reduction between the travel motor and pinion and the drive axle pinion gearshaft. The gears are mounted in a gear case having flanges for mounting the travel motor and for mounting to the drive axle differential housing. The travel motor drives a bearing-mounted gear cluster which in turn drives an input driven gear. The pinion gearshaft is spline engaged in the input driven gear.

6-109. The drive axle contains a differential gear arrangement which is driven by the adapter pinion gearshaft. The pinion gearshaft engages a ring gear secured to the differential case. The two axle housings provide mounting for the front wheel brake assemblies. Many parts which comprise the drive axle can be removed without removal of the axle from the truck. However, for general overhaul, the axle requires removal.

6-110. ADAPTER DISASSEMBLY. Refer to figure 7-37 and proceed as follows:

(1) Remove the adapter from the truck (para 6-90).

(2) Remove screws (9), nuts (8) and washers (11) holding gearshaft bearing cage (22) to adapter housing (24). Remove housing and gasket (23). Measure and record gasket thickness for reference at assembly.

(3) Free retaining ring (5) holding collar (4). Slide collar down, and remove cushions (1) and sleeve (6) on axle side coupling half (7). Remove sleeve from motor side coupling half and any cushions that may have remained with motor when separated.

(4) Remove cotter pin (3) and nut (2) from pinion gearshaft (20). Take coupling half from pinion gearshaft and remove collar and retaining ring.

(5) Remove six screws (14) and washers (15). Remove oil seal and retainer (13), thrust washers (16), spacers (18) and gaskets (17) from cage.

(6) Remove double row roller bearing (19) from cage. Remove retaining ring, and take pinion gearshaft (20) with race and retaining ring from cage. Take single row bearing (21) from cage.

6-111. DRIVE AXLE DISASSEMBLY. Refer to figure 7-35, except where indicated, and proceed as follows:

(1) Remove drive axle (para 6-90).

(2) Drain lubricant from axle (figure 5-1).

(3) Remove drive wheels (para 6-76).

(4) Remove screws (44 and 45) and washers (46) and remove gear case (58) with brake assembly from axle housing (79). Remove gasket (66 and oil seal 59).

(5) Remove hub cap (52), cotter pin (53), spindle nut (54) and washer (55) from spindle (63). Take final drive gear (60), bearing cups (61) and cones and rollers (62) from spindle.

(6) Remove four nuts (64) and washers (65) holding spindle (63) to axle housing (79) and remove spindle.

(7) Draw axle gearshaft (69) with bearing (68) and collar (67) from housing. If they are to be replaced, press off bearing and collar.

(8) Remove nuts (70) and washers (71 and 74) from studs (73) in differential housing (94). Don't remove studs unless damaged. Tap axle housings (78 and 79), if necessary, to free tapered dowels (72) on studs. Separate housings and remove tapered bushings.

NOTE

Differential bearing cups (80) will remain with axle housing, causing differential assembly to drop slightly within its housing when axle housings are removed.

(9) Carefully remove gaskets (81 and 82) from studs. Before diccarding these gaskets, measure and note total gasket thickness removed at each side. Same thickness of new gaskets is to be used as a starting point in making pinion and drive gear adjustments at assembly.

(10) Remove bearing cups (80) from axle housing (78 and 79) and cone and roller bearings from case halves (87). The cups (80) will probably have remained in the bore of axle housings during removal operation.

(11) Punch mark differential case halves (87) for alignment on assembly. Separate differential case halves by removing screw (88). Washers (90) and side gears (89) will be loose when separating differential case halves. Remove them.

(12) Remove thrust washers (91) and spider pinions (92) from spider (93). Center punch rivet heads (86), drill through heads and press out rivets. Remove gear (85) from case (87).

6-112. CLEANING DISASSEMBLED PARTS. Clean parts of disassembled adapter and drive axle as follows:

(1) Clean all housings, shafts, gears and shims with SD and dry with compressed air under moderate pressure. Be sure to clean parts thoroughly to facilitate inspection.

(2) Clean brake assemblies with compressed air under moderate pressure.

(3) Clean bearing cups and cones and rollers in SD. Do not rotate cones and rollers prior to cleaning. Dry parts with compressed air under moderate pressure.

6-113. INSPECTION. Inspect cleaned parts of adapter and drive axle as follows:

(1) Inspect all bearings for roughness, pitting of rollers, cones, and cups, cracked cones or cups. To inspect for roughness, place cones and rollers in associated cups and rotate cups slowly with axis of bearing vertical. If roughness is detected, check for metallic chips or other foreign matter between cones and rollers.

(2) Inspect all threaded parts and tapped holes for stripping or other damage.

(3) Check axle shafts for runout in excess of 0.010-inch total indicator reading.

(4) Inspect bearing mounting surfaces on axle shafts, on differential case halves and on pinion gearshaft for wear as a result of bearing failure. Also check bearing cone bores in adapter case, in axle housings and in differential housing for wear as a result of bearing failure.

(5) Inspect all gears and pinions for worn, chipped or rough teeth.

(6) Inspect adapter case, axle housings, differential housing and differential case halves for cracks and distortion.

(7) Inspect bearing surfaces on cross and bearing bores in spider pinions for scoring and for wear resulting in loose fit.

6-114. REPAIR. Repair adapter and drive axle parts follows:

(1) Repair slight thread damage with tap or threa chaser. Repair stripped threads in castings by installin thread inserts.

(2) Repair slight axle shaft runout by pressing o hammering to bring runout within limits of 0.010-inch tota indicator reading.

6-115. REPLACEMENT. Replace adapter and drive axl parts as follows:

(1) Replace all damaged, worn or defective parts tha cannot be made serviceable by repair procedures outlined above.

(2) Replace all seals with new parts at each overhaul.

(3) Always replace thrust washers in sets only.

6-116. ADAPTER ASSEMBLY. Refer to figure 7-37 and proceed as follows:

(1) Press single row bearing (21) into recess cage (22) Install race, retaining ring, and pinion gearshaft (20). Install double row bearing (19) in cage and on pinion gearshaft.

(2) Install spacers (18) and gaskets (17), thrust washe (16) and oil seal and retainer (13) in cage. Retain with si screws (14) and washers (15).

(3) Assemble collar (4) and retaining ring (5) to coupling half (7), and attach coupling half to pinion gearshaft with nut (2).

(4) Install sleeve (6) and cushions (1) in coupling half (7).

(5) Install bearing cage (22) and gasket (23) to adapter housing. If adapter is not to be installed immediately secure a package of gaskets (12) totaling thickness of gaskets removed to adapter, for use when it is installed.

6-117. DRIVE AXLE ASSEMBLY. Refer to figure 7-35, except where noted, and proceed as follows:

(1) If differential bearing cones and rollers (75) have been removed, press new ones onto trunnions of case halves (87).

(2) Rivet bevel gear (85) to case half (87) with new rivets (86). If a new gear or differential case is to be used in the assembly, the rivet holes in the gear and case should be checked for alignment and line reamed if necessary. The gear must be tight on the case pilot and riveted flush with the differential case flange. Check with a 0.002-inch feeler gage. Rivets should not be heated, but should be upset cold. When the correct rivet and rivet set is used the head being formed will be at least 1/8 inch larger in diameter than the rivet hole. The head will then be approximately the same

height as the preformed head. The formed head should not exceed 1/16 inch less than the preformed head as excessive pressure will cause distortion of the case holes and result in gear eccentricity.

(3) Put spring thrust washers (91) and spider pinions (92) on spider (93); replace thrust washers (90) and side gears (89) in case halves (87).

(4) Place spider with washers and pinions in position in one case half, position other case half with side gear and washers installed, so mating marks (punched at disassembly) are aligned and install screws (88). Tighten all bolts equally and check for freedom from binding by turning one side gear (89) at a time using an axle gearshaft (69) temporarily inserted in side gear splines.

(5) With differential assembly installed in housing, pass a three-foot long piece of rod or pipe through the differential case and spider, as a handle to aid in positioning it.

(6) Install new gaskets (82 and 81) on studs of differential housing (94) to total the same thickness at each side as was removed and noted at disassembly.

(7) Install differential case bearing cups (80) in base of housings (78 and 79). Positioning differential with rod, install axle housings on studs of differential housing. Replace nuts (70), washers (71) and alignment dowels (72).

(8) Adjust differential assembly bearing preload (para 6-118).

(9) Replace pinion gear adapter (8) using attached gaskets (para 6-116). Install screws (9 and 10, figure 7-37), lock washer (11, figure 7-37) and nuts (8, figure 7-37).

(10) Adjust for drive gear and pinion backlash and for the tooth contact pattern (para 6-118).

(11) Press bearing (68) and collar (67) onto axle gearshaft (69) and install gearshaft through axle housing (79) so splines enter splines in differential side gear (89).

(12) Replace spindle (63) on housing (79), studs (77) and secure with washers (65) and nuts (64).

(13) Replace cone and rollers (62) on spindle, and cup (61) in final drive gear (60). Put final drive gear on spindle and replace cup (57), cone and rollers (56), washer (55), nut (54) and cotter pin (53).

(14) Using new gasket (66) and oil seal (59), install final drive gear case (58) (with brake assembly attached) on axle housing.

(15) Replace front wheel, hubcap, and brake lines and fittings.

6-118. ADJUSTMENTS. Three basic adjustments are to be made when the differential has been reassembled after replacement of parts. These are the differential bearing preload adjustment (to be made first), the drive gear and pinion backlash adjustment, and the tooth contact adjustment. Adjust differential bearing preload to be between 0.000-inch and 0.003-inch loose as follows:

NOTE

The latter two adjustments are so related that a change in either one causes a change of the other adjustment.

(1) Install both axle housings (78 and 79) with same thickness of gaskets (81 and 82) at each side as was removed at disassembly.

(2) Turn drive gear (85) by hand, testing for noticeable drag due to trial preload condition of bearings (75 and 80). If no drag exists, remove axle housings, remove one or more gaskets (82 or 81) and repeat test until drag is noticed. Gaskets 0.005-inch thick and 0.0075-inch thick are used. Decrease total gasket thickness in 0.0025-inch steps by removing two 0.005-inch gaskets and adding one 0.0075-inch gasket.

(3) If drag is noticeable on first trial, reverse procedure for decreasing gasket thickness given above until no drag is present, then decrease total gasket thickness until drag is felt. Preload will now be between 0.000-inch and 0.003-inch loose, as required.

(4) Install three adapter-to-axle gaskets (12, figure 7-37) and install adapter to assembled axle.

(5) Remove drain plug (83, figure 7-35) from differential housing. Install plug (3/4-14 NPT threads) with slightly longer reach, to contact and lock bevel gear (85) from rotation.

(6) Install a dial indicator on the adapter flange, to take a reading at a tangent point 1.10-inches from the center of the coupling half. Rotate coupling half through freedom permitted by pinion and ring gear backlash. Reading is to be 0.005-inch to 0.015-inch. Adjustment to correct is given in step 7. below.

NOTE

Several adjustments of both pinion and ring gear setting may be necessary in the following procedure before the correct adjustment is achieved. It is not possible to specify the exact thickness of gaskets to be added, removed, or exchanged at any stage. This must be determined by trial and error.

(7) Apply a thin coating of red lead to drive face of ring gear teeth, and reinstall adapter to axle, adding gaskets (12, figure 7-37) to increase backlash, or using fewer gaskets to decrease backlash.

(8) Engage adapter coupling half (7) with a pry bar, and turn it until differential has made one revolution in the forward direction.

(9) Remove adapter from axle. Examine teeth of ring gear, and compare marks in red lead from pinion gear contact.

NOTE

> Ring gear is on left side of pinion when installed. References to follow will be on this basis.

(10) If marks in red lead indicate high, narrow tooth contact (pinion too far out), adjust by removing one or more adapter-to-axle gaskets to move pinion in direction, and transfer one or more axle housing-to-differential housing gaskets from left side of differential housing to right side. Repeat above to check results of adjustment.

NOTE

> Do not change total thickness of side gaskets used; merely change them from one side to the other as needed, so the differential bearing preload will not be changed.

(11) Lubricate drive axle (figure 5-1).

6-119. STEERING AXLE.

6-120. The steering axle comprises a forged axle, two steering arms (to which the rear truck wheels mount), a bellcrank and axle mounting blocks. The bellcrank connects to the steering gear by means of a drag link. Conventional tie rods connect the bellcrank to the two steering arms.

6-121. DISASSEMBLY. Refer to figure 7-34 and proceed as follows:

(1) Remove hub cap (5). Remove tire (11) and wheel (12) as an assembly by removing cotter pin (7), nut (8) and washer (9). Carefully pull wheel from steering knuckle (29 or 30) to avoid damaging oil seal (13). The inner bearing cone and rollers (6) may remain with the knuckle. The outer bearing cone and rollers and bearing cups (10) will remain in the wheel. Remove bearing cups, cone and rollers.

(2) Remove seals (13) from steering knuckles (29 and 30). Remove axle blocks (4) from axle (42).

(3) Remove two tie rod assemblies attached with cotter pins (18 and 21) and nuts (19 and 22).

(4) Loosen clamps (24) secured with bolt (25), nut (26) and washer (27). Unscrew tie rod ends (17 and 20) from tie rod (23).

(5) Remove bearings (34) steering knuckles (29 and 30) attached with screws (31), nuts (32 and washers (33).

(6) Remove bellcrank lever (38) and two bearings (41) secured with retaining ring (39) and two washers (40).

6-122. CLEANING. Clean disassembled parts as follows:

(1) Wash all metallic parts in SD and dry w compressed air under moderate pressure. Be sure to cle parts thoroughly to facilitate inspection.

(2) Clean neoprene axle blocks with cloth or cott waste moistened with SD.

6-123. INSPECTION. Inspect parts as follows:

(1) Inspect neoprene axle blocks for crackin deformation, splitting and deterioration.

(2) Inspect threaded parts for stripped or damage threads.

(3) Inspect tie rods for damaged ends. Also check tha tie rods are not bent or deformed.

(4) Inspect axle, bell crank, spindle pins and steering arms for cracks and distortion.

(5) Inspect bearings in bell crank and bearings in steering arms and bearings in axle forging for wear.

6-124. REPAIR AND REPLACEMENT. Replace parts removed from steering axle as follows:

(1) If practicable, repair damaged threads with a tap or thread chaser.

(2) Replace all parts that are cracked, worn, distorted or deteriorated.

6-125. REASSEMBLY. Reassembly steering axle as follows:

(1) Install washers (40), bearings (41) and bellcrank (38) on axle (42). Secure with ring (39).

(2) Pack bearings (36) with automative grease and install bearings (36), knuckles (29 and 30), pins (35), washers (33), screws (31) and nuts (32).

(3) Replace tie rod ends (17 and 20) on tie rods (23). Do not tighten clamps (24) until after adjustment of wheel alignment.

(4) Install tie rod assemblies to connect bellcrank to steering knuckles.

(5) Replace seals (13) on spindles of steering knuckles (29 and 30). Put one bearing cone and roller (6) on spindle of knuckle. Press both bearing cups (10) into wheel and put wheel on spindle, followed by second bearing cone, washer (9), nut (8) and cotter pin (7). Replace cap (5). Repeat for second wheel.

6-126. ADJUSTMENT. The following adjustment can be made most conveniently before installation of the steering axle. However, the adjustment can be made with the axle installed, as well. Adjust as follows:

(1) With axle level fore and aft, measure distance between inside tires at hub height, first at front, then at rear. If measurements are within 1/16-inch of each other, no adjustment is needed. Tighten tie rod end clamps (24) on tie rods. If readings are outside limits, proceed to step below.

(2) Turn each tie rod (17 and 20) an equal amount (with clamps (24) still not tightened) until wheels are parallel, as measured in step (1) above.

(3) Tighten tie rod end clamps.

6-127. HAND AND SEAT BRAKE.

6-128. The hand-motor brake system incorporates a hand brake lever and a mechanical seat linkage to apply brake shoes to the brake drum attached to the travel motor armature shaft. This braking system is applied automatically when the operator leaves the seat or may be applied by the operator by means of the brake lever.

6-129. REMOVAL. Remove motor brake shoes and drum as follows:

(1) Remove clevis rod (38, figure 7-28) at link (3, figure 7-36) secured with pins (41 and 42, figure 7-28).

(2) Remove nut (9, figure 7-36) and two springs (10) mounted on rod (8).

(3) Remove brakeshoes (17) attached to motor with nut (56), washer (57) and stud(58). Remove bushings (16) from brakeshoes.

(4) Remove brake drum (18) attached with woodruff key, nut (20) and cotter pin (21) from motor shaft.

6-130. REPAIR AND REPLACEMENT OF MOTOR BRAKE PARTS. Repair of motor brake parts is limited to removal and replacement of bushings in brake shoes. Press bushings out of shoes and install new bushings. Replace brake shoes. If brake linings are worn to less than 1/16-inch at any point, replace brake shoes. Replace brake drum if scored, corroded or pitted. Replace any other parts that are distorted or excessively worn

6-131. INSTALLATION OF MOTOR BRAKE SHOES AND DRUM.

(1) Place motor brake drum (18, figure 7-36) with woodruff key on motor shaft and secure with nut (20) and cotter pin (21).

(2) Place brake shoes on mounting stud (58) and secure with washer (57) and nut (56).

(3) Place compression springs (10) between ends of brake shoes; then, insert rod cup (8) through brake shoes and springs. Secure rod in place with self-locking nut (9).

(4) Secure link (3) between clevis on lower brake shoe with anchor pin (4). Insert cotter pin (7) through end of anchor pin to secure anchor pin.

(5) Insert link pin through clevis (38, figure 7-28) on rod (36) and through link; then, insert cotter pin (42) through link pin to secure pin.

6-132. SERVICE BRAKES.

6-133. DISASSEMBLY (figure 7-35).

(1) Remove front wheels from drive axle (para. 6-76).

(2) Remove wheel hubs.

(3) Disconnect both brake tubing (15) from adapters (19) on each wheel cylinder (41). Use care to prevent kinking or denting tubing and to avoid entrance of foreign matter.

(4) Remove screw (49) and washers (50) securing brake assemblies and spacer (42).

(5) Use brake servicing tools to remove retaining spring (28) and return spring (27); then, lift off brake shoes.

(6) Remove bolts (35) and washers (36) which secure wheel cylinders to backing plates; then, withdraw wheel cylinders.

NOTE

If wheel cylinders show evidence of fluid leakage, repair cylinder or replace.

6-134. CLEANING. Remove dust from parts with compressed air and a stiff bristle brush. If brake fluid has leaked onto brake shoe linings, replace linings and clean other parts with alcohol. If grease from axle has contaminated parts, wash parts (except wheel cylinders) in SD, and replace linings on brake shoes.

CAUTION

Do not allow SD to come in contact with rubber parts. SD will cause rubber to swell and rot.

6-135. INSPECTION.

(1) Inspect wheel cylinders for evidence of fluid leakage.

(2) Inspect linings on brake shoes for excessive wear.

(3) Inspect backing plates for distortion or other damage.

(4) Inspect tapped holes and threaded parts for stripping of threads or other thread damage.

6-136. REPAIR.

(1) If linings on brake shoes are worn to less than 1/16-inch at the thinnest point, install new bonded linings. Install linings in accordance with good practice and instructions for use of equipment available.

(2) Repair minor thread damage (if practicable) with tap or thread chaser.

(3) Replace all distorted or damaged parts.

6-137. ASSEMBLY.

(1) Install wheel cylinder assembly on backing plates with spacer (42, figure 7-35), bolts (35) and washers (36).

(2) Place brake shoes on backing plate studs and install return springs and retaining springs with brake service tools.

(3) Install backing plates (43) on axle housings and secure with screws (49) and washers (50).

(4) Connect brake tubings (15) to adapters (19) in wheel cylinders.

(5) Adjust brake shoes for proper shoe to brake drum clearance (para 6-36).

6-138. WHEEL CYLINDER REPAIR. Proceed as follows:

(1) Remove rubber boots (37) from ends of wheel cylinder.

(2) Remove pistons (38), cups (39) and spring (40) from wheel cylinder.

(3) Clean metal parts in alcohol. Wipe rubber parts with clean soft lint-free cloth.

(4) Inspect bore in cylinder and pistons for scoring or pitting.

(5) Remove minor pitting or scoring by honing. If piston or cylinder cannot be made serviceable by honing, replace entire wheel cylinder assembly.

(6) Discard parts for which new parts are supplied in wheel cylinder repair kit.

(7) Insert spring (40), cups (39) and pistons (38) into bore in wheel cylinder.

(8) Snap boots (37) onto ends of wheel cylinder.

(9) Install wheel cylinders on truck.

6-139. MASTER CYLINDER.

6-140. INSPECTION AND REPAIR. Proceed as follows (figure 7-29):

(1) Remove filler cap and gasket from cylinder (and discard fluid in reservoir.

(2) Pull push rod (34) free of bellows (33) and rem bellows.

(3) Remove retaining ring and withdraw piston st piston, primary cup, spring, and check valve, from ins bore of body.

(4) Inspect all rubber parts for swelling, distortion wear. Check that edges of primary cup, and secondary c on piston are sharp and not flared.

NOTE

> If either cup shows any sign of damage, install the complete master cylinder repair parts kit.

(5) Inspect bore of master cylinder for scratches, ru spots or pitting. Remove minor surface defects with a bra cylinder hone.

(6) Inspect check valve for cleanliness, firm spri action, and tight sealing when closed.

(7) Probe ports visible through reservoir fill hole wi fine wire to be sure they are clean. If necessary to flu reservoir, use only pure denatured alcohol.

(8) Install check valve in bore of cylinder, to botto followed by spring, primary cup, piston and piston stop.

(9) Install retaining ring to hold these parts in place.

(10) Slide push rod into small end of bellows, th install bellows on master cylinder. If unit is not to installed immediately, cap or plug all openings to keep o dirt.

6-141. TIRE REPLACEMENT.

6-142. GENERAL. Replacement of tires is usually ma by pressing off old tire simultaneously with pressing on ne tire. Force required to replace a tire is 5,000 pounds f each inch of wheel diameter. For example, a tire used on wheel 18 inches in diameter requires 18 x 5,000 pounds 90,000 pounds (45 tons) press capacity.

6-143. TIRE REPLACEMENT PROCEDURE. Proceed follows:

(1) Remove wheel from truck.

(2) Support felloe of wheel with a ring slightly smaller diameter than wheel felloe and at least as wide as tire to pressed off.

(3) Place new tire over old and center carefully.

(4) Slowly lower press ram, check alignment, an proceed with pressing operation.

(5) Be sure that force is always applied through metal base band and that there is no interference with the rubber. Never hammer tire. Use ring rather than block for supporting wheel and applying force to tire.

NOTE

In some cases removal of old tire may be difficult due to peened-over condition of base band or felloe. In such cases, remove old tire by burning or cutting through base band. In mounting tires on wheels without old tires, use care to insure that felloes are smooth and free of burrs. Also carefully check alignment to assure that new tire starts on squarely and is not cocked on wheel.

(6) Reinstall wheel on truck.

6-144. STEERING GEAR REPAIR.

6-145. GENERAL. Complete disassembly of the steering gear at one time is not an overhaul operation. The instructions in following paragraphs present complete information necessary to correct any malfunction of the gear. Before beginning repairs, diagnose the probable cause of the malfunction by referring to the troubleshooting chart for the steering gear (figure 6-8) at the end of the steering gear instructions. Limit disassembly to necessary operations.

6-146. ADJUSTER PLUG DISASSEMBLY. Proceed as follows:

(1) Loosen adjuster plug locknut (59, figure 7-33).

(2) Remove the thrust bearing retainer (70) with a screwdriver, being careful not to score the needle bearing bore, and discard. Remove thrust bearing spacer (69), thrust bearing (67) and thrust bearing races (66 and 68).

(3) Remove adjuster plug packing (62) and discard.

(4) Remove stub shaft seal retaining ring (63), with snap ring pliers, and remove stub shaft dust seal (60).

(5) Remove stub shaft oil seal (61) by prying out with screwdriver and discard.

(6) Inspect adjuster plug needle bearing (64), and if rollers are broken or pitted, remove needle bearing from adjuster plug by pressing from thrust bearing end using piloted driver. Discard bearing.

6-147. ADJUSTER PLUG ASSEMBLY. Proceed as follows:

(1) Assemble needle bearing (64, figure 7-33) by pressing from thrust bearing end of adjuster plug (65) against identification end of bearing. End of bearing is to be flush with bottom surface of stub shaft seal (61) bore.

(2) Lubricate new stub shaft seal with automatic transmission fluid, TYPE "A", and install far enough to provide clearance for dust seal (60) and retaining ring (63). Lubricate new dust seal with engine oil and install with rubber surface outward. Install retaining ring (63), making certain that the ring is properly seated.

(3) Lubricate packing (62) with automotive grease, and install on adjuster plug. Assemble large thrust bearing race (66), thrust bearing (70), small thrust bearing race (68), and thrust bearing spacer (69) on adjuster plug. Press new bearing retainer (70) into needle bearing bore, using thrust bearing retainer installer.

6-148. ADJUSTER PLUG INSTALLATION. Proceed as follows:

(1) Place tool to protect seal over end of stub shaft (88, figure 7-33).

(2) Install adjuster plug assembly in gear housing. Adjust thrust bearing preload according to paragraph 6 below, and tighten locknut to 50 to 110 foot pounds.

6-149. STEERING GEAR VALVE REMOVAL. The complete valve in each steering gear is a precision unit with selective fitted parts and is hydraulically balanced at assembly. Only those parts which are service items are replaceable and interchangeable. No other valve parts are individually interchangeable. If replacement of any nonserviceable valve part is necessary, the complete rotary valve assem bly must be replaced. Do not disassemble the valve unless necessary since this may result in damaging the assembly. If the valve spool dampener packing requires replacement, remove valve spool only, replacing packing, and reinstall spool immediately. Do not disassemble further. Proceed as follows:

NOTE

It is very uncommon to have to make any service repairs to the valve assembly, with the exception of the valve spool dampener packing.

(1) Remove adjuster plug assembly as outlined under paragraph 6-143.

(2) Remove valve assembly from gear by grasping stub shaft (88, figure 7-33) and pulling out valve assembly and stub shaft.

6-150. VALVE DISASSEMBLY. Proceed as follows:

(1) Remove packing (92) and discard.

(2) Remove spool spring (82) by prying small coil, using small screwdriver. Do not pry against the valve body (87) as this may result in a sticky valve. Work spring onto bearing diameter of the stub shaft (88). Slide the spring off the stub shaft.

(3) Remove valve spool (84) with extreme care. To remove valve spool (84), hold valve assembly in both hands with stub shaft pointing downward. Push lightly on valve spool with a small rod by inserting rod through openings in valve cap (91) until spool is far enough out of valve that it may be grasped by the hand. Withdraw spool with a steady oscillating pull to prevent jamming. If slight sticking occurs, make a gentle attempt to reverse withdrawal procedure. If this does not free the spool, it has become cocked in the valve body bore. Do not attempt to force the spool in or out if it becomes cocked. In this case, continue to disassemble the valve assembly as follows and return to the spool as described below.

CAUTION

The diametral clearance between the valve body and the spool may be as low as 0.004 inch. The slightest cocking of the spool may jam it in the valve body.

(4) Remove the stub shaft (88), torsion bar and valve cap assembly (91) by holding the valve assembly in both hands as before, only with thumbs on valve body. Rap torsion bar lightly against the work bench. This will dislodge the cap from the valve body. If the valve spool has become cocked as described above, it can now be freed. By visual inspection on a flat surface it can be determined in which direction the spool is cocked. A few very light taps with a light soft plastic or rawhide mallet should align the spool in the bore and free it.

CAUTION

Do not tap with anything metallic. If spool can be rotated, it can be removed.

(5) Remove dampener seal packing (83) from spool and discard.

(6) Where the valve rings (85) show evidence of excessive wear, carefully cut rings and ring back-up packing (86), remove and discard. The valve rings are made of filled teflon and it is very unusual that replacement is required.

6-151. VALVE INSPECTION. Proceed as follows:

(1) If the valve assembly leaks externally around the torsion bar (91) replace the entire assembly.

(2) Check the pin in the valve body (87) which engages the cap. If it is badly damaged, replace the entire valve assembly.

(3) Check the worm pin groove (the smaller of the two) in the valve body. If it is damaged, replace the entire valve assembly.

(4) Check the spool drive pin in the stub shaft (88). If i is worn badly, cracked, or broken, replace the entire valv assembly.

(5) Examine the spool (84) surface for nicks and burrs. If any are found, they may be removed with a very fine hone. A slight polishing is normal on the valving surfaces.

(6) Examine the valve body bore for nicks or burrs. If any are found, they can be removed with light crocus cloth until the spool turns freely in the body. Be careful not to remove any stock from the surface of the body. As on the spool, a slight polishing is normal on the valving surfaces.

6-152. VALVE ASSEMBLY. Proceed as follows:

(1) Lubricate three valve ring back-up packings (86) in SAE 10 engine oil. Assemble in three ring grooves on the valve body (87). Assemble the valve rings (85) in the ring grooves over the back-up packings by carefully slipping the rings over the valve body. The rings may appear loose or twisted in the grooves, but the heat of the oil after assembly will cause them to tighten.

(2) Install new valve spool dampener packing (83) in valve spool (84) groove.

(3) Assemble the stub shaft in the valve body. Align groove in valve cap (91) with pin in valve body. Tap lightly on cap with plastic or rawhide mallet until cap is against shoulder in valve body with valve body pin in cap groove.

CAUTION

Make sure groove and pin are in line before tapping on cap. Hold these parts together during the rest of the assembly.

(4) Lubricate valve spool with SAE 10 engine oil. Slide spool over stub shaft with notch toward valve body. Align notch with spool drive pin in stub shaft and carefully engage spool in valve body bore. Push the spool evenly and slowly with a slight oscillating motion until spool reaches drive pin. Rotate the spool slowly with pressure until the notch engages the pin. Before pushing the spool completely in, make sure the dampener packing is evenly distributed in the spool groove. Slowly push the spool completely in. Take extreme care not to cut or pinch the packing.

CAUTION

Because the clearance between the spool and the valve body is very small, extreme care must be taken when assembling these parts.

(5) Place seal protecting tool over stub shaft. Slide spool spring over seal protector and work spool spring (82) down until it is seated in stub shaft groove. Take care not to mar sealing surface of stub shaft.

(6) Lubricate a new cap-to-worm packing (92) with SAE 10 engine oil, and install in valve assembly.

(7) If during the assembly of the valve, the stub shaft and cap assembly is allowed to slip out of engagement with the valve body pin, the spool may enter the valve body too far. The dampener packing will expand into the valve body oil grooves, preventing withdrawal of the spool. Attempt to withdraw the spool with slight pulling and much rotary motion. If this does not free the spool after several tries, make sure spool is free to rotate; place valve body on flat surface with notched end up, and tap spool with wooden or plastic rod until packing is cut and spool can be removed. Replace packing and proceed with assembly as before.

6-153. VALVE INSTALLATION. Proceed as follows:

(1) Align valve body drive pin in the worm (71) with the narrow pin slot on the valve body (87). Insert the valve assembly into the gear housing (97). Do not push against stub shaft as this may cause stub shaft and cap to pull out of the valve body, allowing spool seal to slip into valve body oil grooves. Valve assembly should be pushed in by pressing against valve body with finger tips. Be sure valve is properly seated before assembling adjuster plug assembly. Return hole in gear housing should be fully visible at this time.

(2) Install adjuster plug (65) assembly as outlined in paragraph 6-148.

6-154. SECTOR GEARSHAFT AND SIDE COVER REMOVAL. Proceed as follows:

(1) Rotate stub shaft (88) until sector gearshaft (49) is in center position and remove side cover retaining screws (39). Tap the end of gearshaft with soft mallet and slide gearshaft out of housing.

(2) Remove side cover packing (43) from side cover and discard.

6-155. SECTOR GEARSHAFT AND SIDE COVER DISASSEMBLY. Proceed as follows:

(1) Hold lash adjuster (47) with a hex key wrench and remove the lash adjuster nut (44) and discard. Screw lash adjuster out of side cover (42).

(2) Remove the sector gearshaft seal retaining ring (51), and then remove the outer back-up washer (52). Tap a screwdriver between the outer seal and the inner back-up washer and pry out the seal. Tap the screwdriver between the inner seal and the shoulder in the gear housing and pry out the seal. Be careful not to damage the seal bore. Discard seals.

(3) Remove needle bearing (94) from gear housing bore by pressing on the stamped identification end of the bearing. Discard bearing.

6-156. SECTOR GEARSHAFT AND SIDE COVER INSPECTION. Proceed as follows:

(1) Inspect the sleeve bearing (41) in the side cover (42) for excessive wear or scoring. If badly worn or scored, replace the side cover and bearing as an assembly.

(2) Check the sector gearshaft teeth and the bearing and seal surfaces. If badly worn, pitted, or scored, replace the gearshaft assembly.

(3) Check the needle bearing (94) in the housing.

6-157. SECTOR GEARSHAFT AND SIDE COVER ASSEMBLY. Proceed as follows:

(1) Assemble new needle bearing (94) into the gear housing (97) bore from seal bore end, pressing against stamped identification end. Press in until bearing clears shoulder in gear housing 0.030 inch maximum.

(2) Lubricate new gearshaft seals in SAE 10 engine oil. Install the single lip seal (54) first, then a back-up washer (52). Drive the seal and washer in far enough to provide clearance for the other seal, and back-up washer, and retaining ring. Seal must not bottom on end of counterbore. Install double lip seal (53) and second back-up washer. Drive seal and back-up washer in only far enough to provide clearance for the retaining ring. Install sector gearshaft retaining ring (51), making certain that the ring is seated properly.

(3) Assemble side cover (42) and bearing (41) assembly on the sector gearshaft assembly. Screw the lash adjuster (47) through the side cover until the side cover bottoms on the gearshaft, and back off 1/2 turn.

6-158. SECTOR GEARSHAFT AND SIDE COVER INSTALLATION. Proceed as follows:

(1) Lubricate the new side cover packing (43) and install in the groove in the face of the side cover (42).

(2) Turn the stub shaft (88) as necessary until the middle rack groove is aligned with the center of the gearshaft needle bearing (94).

(3) Install the gearshaft (49) so that the center tooth in the sector meshes with the center groove of the rack on the ball nut (77). Make sure that the side cover packing is in place before pushing the side cover down on the gear housing.

(4) Install the side cover screws (39) and tighten to 30 to 35 foot pounds.

(5) Install lash adjuster nut (44) on lash adjuster without tightening. Adjust gearshaft (refer to paragraph 6-168). Hold lash adjuster from rotating with a hex key wrench and tighten lash adjuster nut to 20 to 30 foot pounds.

6-159. HOUSING END PLUG REMOVAL. Proceed as follows:

(1) Rotate end plug retainer ring (56) so that one end of the ring is over the hole in the housing. Spring one end of ring with punch to allow screwdriver to be inserted to lift ring out.

(2) Rotate stub shaft (88) with 3/4 inch box end or socket wrench to left turn corner position and force end plug (55) out of housing.

CAUTION

> Do not rotate further than necessary, or the balls from the rack and worm assembly will fall off the end of the worm.

(3) Remove and discard housing end plug packing (57).

6-160. HOUSING END PLUG INSTALLATION. Proceed as follows:

(1) Lubricate new housing end plug packing (57) with SAE 10 engine oil, and install in gear housing (97).

(2) Insert housing end plug (55) into gear housing and seat against packing.

(3) Install end plug retainer ring (56) with fingers. Install one end of ring and work ring into groove until seated. Slight tapping may be required to securely bottom retainer ring in gear housing.

6-161. RACK-PISTON END PLUG REMOVAL. Proceed as follows:

(1) Remove housing end plug as outlined in paragraph 6-159.

(2) Remove rack-piston end plug (58) by inserting a 1/2 inch drive socket extension into the square hole in the plug and turning counterclockwise.

6-162. RACK PISTON END PLUG INSTALLATION. Proceed as follows:

(1) Turn plug into rack-piston and tighten to 50 to 100 foot pounds.

(2) Install housing end plug as outlined in paragraph 6-160.

6-163. RACK-PISTON AND WORM ASSEMBLY AND GEAR HOUSING ASSEMBLY REMOVAL. Proceed as follows:

(1) Remove housing end plug as outlined in paragraph 6-159.

(2) Remove rack-piston end plug as outlined in paragraph 6-161.

(3) Remove sector gearshaft assembly as outlined in paragraph 6-154.

(4) Insert rack-piston arbor in end of worm (71). Rotate stub shaft to left turn, which will force rack-piston ball nut (77) onto arbor, and remove rack-piston ball nut from gear housing, taking card to keep arbor in place in the rack-piston nut or the balls will fall out. If rack-piston ball nut is being removed to replace the piston ring (72) and back-up packing (73), reassemble without further disassembly.

(5) Remove valve assembly as outlined in paragraph 6-149.

(6) Remove worm, lower thrust bearing and races.

6-164. RACK-PISTON AND WORM ASSEMBLY AND GEAR HOUSING DISASSEMBLY. Proceed as follows:

(1) Cut piston ring (72) and packing (73) back-up seal remove from rack-piston ball nut (77) and discard.

(2) Remove screws and lock washers (75) from rack-piston nut with screwdriver.

(3) Remove ball return guide clamp (74).

(4) Place the assembly on a clean cloth and remove ball return guides (76) and arbor. Make sure all of the balls (78) are caught on the cloth.

6-165. RACK-PISTON AND WORM ASSEMBLY AND GEAR HOUSING INSPECTION. Proceed as follows:

(1) Inspect housing assembly. If bore is badly scored or worn, replace housing. If connectors (95 and 96) are badly brinelled or scored, replace them. To remove connectors tap threads in connectors, using a 5/16-18 tap. Thread a bolt with nut and flat washer attached into tapped hole. To pull connector, hold bolt from rotating while turning nut off bolt. This will pull connector from gear housing. Discard connectors.

(2) Inspect ball plug (93) in housing. If it is leaking or raised above housing surface, drive it in flush, to 1/16 inch below the surface. Tighten ball by staking the housing. If leakage cannot be stopped, housing must be replaced.

(3) Inspect all seal surfaces and retaining ring grooves for defects. If any defects are found, housing must be replaced.

(4) At initial assembly, the rack-piston nut, worm and balls are selected to obtain a preload of 1 to 4 inch pounds measured on center through an angle of 90 degrees. This preload may drop during service, without having any noticeable effect on steering. Upon complaint of loose or hard steering, thrust bearing adjustment and overcenter adjustment will correct the problem if it lies in the steering gear adjustments. If not, check the rack-piston nut and

worm assembly for excessive lash or excessive load overcenter and also for roughness at any point along the worm. If any of these conditions is found, disassemble the assembly and inspect worm and rack-piston nut grooves and all the balls for excessive wear or scoring. If either worm or rack-piston nut need replacing, both must be replaced as a matched assembly. The lash or heavy load may be corrected by replacing the standard balls with a larger or smaller size. Black balls need not be replaced unless they are defective. In event the black balls cannot be distinguished from the standard balls, replace with new balls.

NOTE

The black balls are 0.0005 inch smaller than the silver balls. The black and silver balls must be installed alternately into the rack-piston nut and return guide.

(5) Inspect ball return guides (76), making sure that the ends where the balls enter and leave the guides are not damaged.

(6) Inspect lower thrust bearing (80) and races (79).

(7) Inspect rack-piston ball nut (77) teeth for wear and chipping. Inspect rack-piston nut surface for scoring or burrs.

6-166. RACK-PISTON AND WORM ASSEMBLY AND GEAR HOUSING ASSEMBLY. Proceed as follows:

(1) Thoroughly clean the parts and lubricate the internal parts with SAE 10 engine oil.

(2) Drive new connectors (95 and 96) in place with piloted driver.

(3) Lubricate a new back-up packing (73) with SAE 10 engine oil. Assemble in piston ring groove on rack-piston nut (77). Install new piston ring (72) in the ring groove over the packing by carefully slipping ring over the rack-piston nut. The ring may be slightly loose after assembly. This is normal. It will tighten when subjected to the hot oil in the system.

(4) Insert worm (71) into rack-piston nut, to bearing shoulder.

(5) Align the ball return guide holes with the worm groove. Load 24 balls (78) into the guide hole nearest the piston ring, while slowly rotating the worm (71) counterclockwise to feed the balls through the circuit. Alternate the black balls with the standard balls.

(6) Fill one of ball return guides with remaining six balls. Place other guide over balls and plug ends with automotive grease to prevent balls falling out when installing guide into rack-piston nut.

(7) Insert guides into guide holes of rack-piston nut. Guides should fit loosely.

(8) Place return guide clamp over guides, install two screw and lock washer assemblies and tighten to 8 to 12 foot pounds.

(9) Insert rack-piston arbor tool into worm. Turn rack-piston onto the arbor. Do not allow arbor to separate from worm until rack-piston nut is fully on arbor.

6-167. RACK-PISTON AND WORM ASSEMBLY AND GEAR HOUSING INSTALLATION. Proceed as follows:

(1) Assemble thrust bearing (80) and races (79) on worm (71). Assemble valve assembly to worm by aligning small slot in valve body (87) with pin on worm. Be sure to install packing (92) between body and worm head.

(2) Install valve assembly and worm in housing (97) as integral unit and continue valve assembly as outlined in paragraph 6-166. Adjust thrust bearings.

(3) Install piston ring compressor in gear housing (97). Hold it tight against shoulder in housing. Insert rack-piston ball nut (77) into housing until arbor engages worm. Turn stub shaft (88) clockwise, drawing rack-piston nut into the housing. When piston ring is in housing bore, withdraw arbor from rack-piston nut. Remove ring compressor.

(4) Install rack-piston plug as outlined in paragraph 6-162.

(5) Install housing end plug as outlined in paragraph 6-160.

(6) Install sector gearshaft and side cover as outlined in paragraph 6-159.

6-168. STEERING GEAR LASH ADJUSTMENT. Proceed as follows:

(1) Disconnect the steering arm from the sector gearshaft and remove the horn button.

(2) Turn the steering wheel 1/2 turn off center (either direction). Using a 24 inch pound torque wrench on the steering wheel nut, determine the torque required to rotate the shaft slowly through a 20 degree arc.

(3) Turn the gear back to center and repeating the method of reading torque as in step b. above, loosen lash adjuster locknut (44), turn screw (47) in until the reading is equal to six inch pounds in excess of reading obtained in step b. above, and retighten the locknut while holding the screw in place.

(4) Recheck the readings and replace steering arm and horn button.

6-169. THRUST BEARING ADJUSTMENT. This adjustment is to be made after the worm, thrust bearings,

valve assembly, adjuster plug assembly, and locknut are assembled in the housing assembly. Proceed as follows:

(1) Before adjusting preload, tighten adjuster plug up snug, back off slightly (1/8 turn) and measure valve assembly drag.

(2) Turn adjuster plug in so that preload is 1 to 3 inch pounds in excess of valve assembly drag. Tighten locknut. Total thrust bearing adjustment and seal drag is not to exceed 8 inch pounds.

6-170. OVERCENTER OR SECTOR GEARSHAFT ADJUSTMENT. This adjustment is to be made after the gear is completely assembled. Proceed as follows:

(1) With gear on center and lash adjuster screw backed off, measure total drag.

(2) With gear on center, adjust lash adjuster so that preload is 4 to 8 inch pounds in excess of total preload and drag. Readings are to be made through an arc not exceeding 20 degrees with gear on center.

(3) Tighten lash adjuster locknut.

6-171. HYDRAULIC PUMP.

6-172. DESCRIPTION. The hydraulic pump is driven by the electric pump motor and provides hydraulic fluid pressure for extending the tilt cylinders and the hoist cylinder. The pump is a positive displacement type having a rated capacity of 8.7 gallons per minute at 1,200 rpm and 1,000 psi. Removal of the hydraulic motor is required for repair.

6-173. DISASSEMBLY. Proceed as follows:

(1) Remove retaining ring (1, figure 7-16) and eight screws (3) securing mounting flange cover (2) to housing (17). Press seal (4) out of mounting flange cover.

(2) Remove driven gearshaft (10, drive gearshaft (11), four bushings (9 and 12) and two pins (13).

(3) Remove two packing retainers (7) and packings (5, 6 and 8). Do not remove two pins (16) from housing (17) unless necessary.

6-174. CLEANING. Clean disassembled parts of hydraulic pump as follows:

(1) Wash all parts in SD and dry with soft cloth or with compressed air under moderate pressure.

(2) Ensure that all fluid passages in housing are free of obstructions.

6-175. INSPECTION. Inspect hydraulic pump parts as follows:

(1) Inspect all threaded parts and tapped holes for stripped threads or other damage.

(2) Inspect mounting flange cover, housing dri shaft and driven gear shaft for cracks and distortion.

(3) Inspect bores in bearings for scoring and pitti for excessive wear as indicated by loose fit on b surfaces of drive gear shaft and driven gear shaft.

(4) Inspect teeth on drive gear shaft and driver shaft for pitting, chipping and excessive wear.

(5) Inspect interior surfaces of pump housin scoring, pitting and other damage.

6-176. REPAIR. Repair hydraulic pump parts as foll

(1) Repair minor thread damage with tap or th chaser.

(2) Replace parts that are cracked or distorted, or are excessively worn.

(3) Replace all packings and seals at each reassembly

6-177. REASSEMBLY. Reassemble hydraulic pump par follows:

(1) If removed, press pins (16, figure 7-16) into ho (17). Fit all packings (5, 6, and 8) neatly into recess housing (17) and flange cover (2).

(2) Fit bushings (9 and 12) together, using pins (13 alignment, install them on gearshafts (10 and 11) replace this assembly in housing.

(3) Press new seal (4) into cover (2), install retaining (1) and replace cover on housing. Secure with screws (3

CAUTION

Tighten cover screws gradually, alternating from side to side of cover, to avoid warping cover by uneven pressure from screws in one area.

(4) If pump is not to be installed immediately, plug and outlet ports to keep dirt out during storage period.

6-178. POWER STEERING PUMP.

6-179. DISASSEMBLY. Proceed as follows:

(1) Remove pump manifold (1, figure 7-31) and ga (4) from steering pump attached with three screws (2) washers (3).

(2) Remove body (10) attached with four screws (Remove packings (12 and 13).

(3) Remove vanes (19) and rotor (20) and separate v from rotor.

(4) Remove relief valve assembly consisting of plug (15), packing (16), valve (17) and spring (18) by pressing out pin (14) from boss on side of cover (25).

NOTE

Some valve parts are under spring pressure. Take care to prevent their being lost when the pin is removed. Do not disassemble valve (17).

(5) Separate pumpshaft (5), washer (6), seal (7) and bearing (8) from body (10).

(6) Remove pins (22) from ring (21) and remove ring, plate (23) and spring (24) from body (10).

6-180. INSPECTION AND REPAIR. Proceed as follows:

(1) Inspect surfaces of all parts which are subject to wear. Light scoring may be removed from faces of body (10) with crocus cloth (by placing cloth on flat surface), medium India stone or by lapping. Check edges of vanes (19) for wear. Vanes must not have excessive play in slots or burrs on edges. Replace if necessary. Check each rotor (20) slot for sticky vanes or wear. Vanes should drop in rotor slots by their own weight when both slot and vane are dry.

(2) Replace pumpshaft seal (7) at each overhaul to prevent oil leakage. Check pumpshaft seal diameter for wear and scoring. Do not install a new seal on a pumpshaft (5) which is worn or damaged at seal diameter. Replace pumpshaft if worn. Stone and polish sharp edges of pumpshaft to prevent damage to seal.

(3) Stone all mating surfaces of body (10 and cover (25) with a medium India stone, if necessary, to remove all burrs and sharp edges. Rewash all parts after stoning.

6-181. ASSEMBLY. Liberally coat all parts with automatic transmission fluid and assemble as follows:

(1) Carefully install new seal (7) and pump shaft (5) in body (10). Avoid damaging bushing in body, and seal.

(2) Install locating pins (22) in pump body. Install ring (21) over pins in correct direction of rotation.

(3) Install rotor (20) with chamfered edge of splined hole toward pump body. The chamfer facilitates assembly.

(4) Install vanes (19) with their radius edge toward the inner ring contour. packings (12 and 13) in grooves of pump body.

(5) Install packings (12 and 13) in grooves of pump body.

(6) Install pressure plate (23) and pressure plate spring (24).

(7) Install cover (25). Tighten cover screws (11) to 25 to 30 foot pounds torque.

(8) Install pressure control valve spring (18) in relief valve bore. Insert valve (17) with hex toward spring. Install plug (15) with packing (16) in bore and hold it in position while driving in a new retaining pin (14).

(9) Install gasket (4) and manifold (1) with washers (3) and screws (2).

6-182. CONTROL VALVE ASSEMBLY.

6-183. DISASSEMBLY. Proceed as follows:

CAUTION

This valve contains numerous similar appearing, but not interchangeable, parts. Before disassembly, arrange separate containers for parts related to each spool, to avoid problems at assembly. Equivalent parts with different index numbers on figure 7-22 are not interchangeable.

(1) Unscrew plugs and seals (36 and 37, figure 7-22). Remove nut (1), nut (3) and seals (2). Back out setscrew (4), and remove spring (9) and plunger (10). Remove safety relief valve cap (5) and packing (8).

(2) Remove packing (6) and retainer (7), seat (11) spring (12), screen (13), plunger (14) and seat (15).

(3) Remove check valve cap (16), packing (17), spring (18) and poppet (19).

(4) Remove screws (22) and retainer plates (21) from both TILT and HOIST valves. Remove wiper rings (23), packing retainers (24) and packings (25).

(5) Take off both spool caps (20), and remove retaining rings (26), four spring retainers (27), springs (29), and washers (28).

(6) Remove packing retainers (30) and packings (31).

(7) Remove spool (33) and spool (32) from body (38).

(8) If identification plate (34) must be replaced, remove drive screws (35).

6-184. CLEANING. Cleaning parts of control valve as follows:

(1) Wash parts thoroughly in SD. Dry parts with soft lintfree cloth or with compressed air under moderate pressure.

(2) Assure that all fluid passages are free of obstructions.

CAUTION

Do not use wire or metallic rod or pick to clean fluid passages since such procedure could result in irreparable damage to parts.

6-185. INSPECTION. Inspect control valve parts as follows:

(1) Inspect valve body for cracks and for scoring or other damage to plunger bores.

(2) Inspect threaded parts and tapped holes for stripping or other damage to threads.

(3) Carefully inspect plungers for surface defects such as scoring, pitting or excessive wear.

(4) Inspect poppet and bearing for wear and scoring.

6-186. REPAIR. Repair control valve parts as follows:

(1) Replace all parts found to be defective during disassembly and inspection.

NOTE

If either of the plungers or the valve body is defective to extent of being unserviceable, replace entire control valve assembly.

(2) Repair minor thread damge with tap or thread chaser.

(3) Remove minor surface defects from parts with crocus cloth (Specification P-C-458).

(4) Replace all packings with new parts at each reassembly.

6-187. ASSEMBLY. Reassemble control valve as follows:

(1) Install packings for plungers in valve body bores; then, insert plungers.

(2) Place washers on ends of plungers. Then, install springs using spring retainer and screws.

(3) Screw plugs to which gaskets have been applied into valve body to cover springs and tighten securely.

(4) Insert bearing into valve body and screw associated plug into valve body.

(5) Place packing in groove of poppet and insert poppet into bearing. Place spring on poppet and spring seat on spring.

(6) Screw relief valve plug into valve body and screw adjusting setscrew into relief valve plug. Install jam nut on adjusting setscrew but leave loose.

(7) Install remaining plugs in valve body.

6-188. ADJUSTMENT. Adjust valve as follows:

(1) Connect pressure part of control valve to a hy
test pressure source of 2,000 psig with a flow ra
gallons per minute (or greater).

(2) Connect hydraulic test source return hose to
port on control valve and temporarily plug unused
valve body.

(3) Raise either plunger and note test pressure.
pressure is not within the range of 1,600 to 1,700 psi
adjusting setscrew clockwise to increase pressu
counterclockwise to decrease pressure.

(4) When relief valve pressure is properly set, tight
nut on adjusting setscrew and install relief valve nu
end of setscrew.

(5) Disconnect control valve from test pressure
and remove temporary plugs.

6-189. TILT CYLINDER.

6-190. DISASSEMBLY. Proceed as follows:

(1) Remove rod end (1, figure 7-17) secured wit
(4), screw (2) and washer (3).

(2) Remove packing retainer (5) attached with
screws (6) and washers (7). Remove wiper ring (8)
inside packing retainer.

(3) Unscrew stuffing box (9) and remove packin
(11), packing (12), ring (13) spacer (14) and rings (1
16) from stuffing box.

(4) Pull piston and rod assembly (17) from cyl
(18). Remove ring (15) from piston and rod assembly.

6-191. CLEANING. Cleaning disassembled parts o
cylinder as follows:

(1) Wash metallic parts in SD and dry with compr
air under moderate pressure or with clean cloth.

(2) Be sure to clean parts thoroughly to faci
inspection.

6-192. INSPECTION. Inspect tilt cylinder parts as fol

(1) Inspect all threaded and tapped parts for str
threads or other thread damage.

(2) Inspect packing retainer, stuffing box, pisto
rod, and cylinder for cracks and distortion.

(3) Inspect bore in cylinder for scratches, sc
pitting and other surface defects.

6-193. **REPAIR.** Repair tilt cylinder parts as follows:

(1) Repair minor thread damage with tap, thread file or thread chaser.

(2) Remove minor surface defects from bore of cylinder by carefully honing. Remove all traces of abrasive after honing.

(3) Replace all cracked or distorted parts with serviceable parts.

(4) Replace wiper ring, packings, backup ring, piston packings and piston guide with new parts at each reassembly.

6-194. **ASSEMBLY.** Thoroughly wet all internal parts with hydraulic fluid before installation. Take particular care to keep parts clean during assembly. Proceed as follows:

(1) Install piston and rod (17) with ring (15) in cylinder (18). Fit (12, 13, 14, 15 and 16) into recess in cylinder, and install stuffing box (9) in cylinder snugly with spanner wrench.

(2) Slide packing set (11) down piston rod, carefully entering it into recess of stuffing box.

(3) Lubricate and install wiper ring (8) in recess of packing retainer (5) and install packing retainer (loosely at first) with screws (6) and washers (7).

(4) Install rod end (1) on piston rod, and replace screw (2), washer (3) and nut (4), but do not tighten, as rod end final position must be adjusted when tilt cylinder is installed.

6-195. HOIST CYLINDER.

6-196. **DISASSEMBLY.** Proceed as follows:

(1) Remove screws (1, figure 7-24) and washers (2). Unscrew cylinder end (3). Remove packing (5) and washer (4) from cylinder end.

(2) Unscrew packing nut (6) from plunger (28). Remove wiper ring (7), packing retainer (8) and five packings (9).

(3) Unscrew packing nut (11) from cylinder (21). Remove wiper ring (12), retainer (13) and five packings (14).

(4) Unscrew packing nut (16) from cylinder (22). Remove wiper ring (17), packing retainer (18) and five packings (19).

(5) Unscrew and remove cylinder (21) from cylinder (22) and remove bearing (15) from inside of cylinder.

(6) Remove plunger (28) and remove bearing (10) from inside plunger. Remove plunger guide (26) secured in position with retaining ring (27). Remove packing (23) and washers (24) from cylinder (22).

(7) Pull cylinder (22) from plunger (29) and remove bearing (25) from cylinder and bearing (20) from inside of plunger (29).

6-197. **CLEANING.** Clean disassembled parts of hoist cylinder as follows:

(1) Clean all removed metallic parts with SD and dry with soft lint-free cloth.

(2) Slide secondary cylinder out of primary cylinder as far as possible and carefully clean exposed surface of secondary cylinder with cloth moistened with SD.

6-198. **INSPECTION.** Inspect hoist cylinder parts as follows:

(1) Inspect all threaded parts and parts with tapped holes for stripped threads or other thread damage.

(2) Inspect packing retainers for scratches, burrs and upset metal.

(3) Inspect cylinders and plunger for cracks and distortion.

(4) Inspect external surfaces of secondary cylinder and secondary plunger for scratches, pitting, scoring, upset metal and other surface damage.

(5) Inspect check valve for free return flow.

6-199. **REPAIR.** Repair parts as follows:

(1) Replace all cracked or distorted parts.

(2) Repair minor thread damage with a tap, thread file or thread chaser.

(3) Remove minor surface defects on surfaces of secondary cylinder and secondary plunger with crocus cloth or with minor honing.

(4) Replace all packings and wiper rings with new parts at each assembly.

6-200. **ASSEMBLY.** Take special care to keep all parts of the hoist cylinder clean during reassembly. Wet interior parts with clean hydraulic oil, before installing them. Reassemble as follows:

(1) Install new bearings (25) over secondary plunger (29). Push plunger into secondary cylinder (22) from bottom and install new packing (23) and washer (24) in groove in base of secondary cylinder. Screw cylinder end (3) into secondary cylinder.

(2) Install bearing (20) in base of secondary cylinder and install packing (19) against base of bearing. Insert packing retainer (18). Insert wiper ring (17) in packing nut (16) and install packing nut in bottom of secondary cylinder.

(3) Install bearing (10) in top end of plunger (28). Install bearing (15) in primary cylinder (21). Install guide (26) and retaining ring (27).

(4) Install cylinder (22) with assembled items through bottom of primary plunger (28) and install both in primary cylinder (21).

(5) Install new packing (14) and retainer (13). Put wiper ring (12) in packing nut (11) and install packing nut in end of primary cylinder (21).

(6) Place packing (9) over plunger (29) and install packing retainer (8). Put wiper ring (7) in packing nut (6); install nut over plunger (29) and thread into plunger (28). Install two new washers (2) and replace screws (1).

6-201. TRAVEL MOTOR.

6-202. DISASSEMBLY. Clean exterior thoroughly, then disassemble only as far as necessary to repair, as follows:

(1) Remove screws (51 and 54, figure 7-36) washers and nuts, and take off covers (50).

(2) Disconnect leads (37 and 38) at brush holders (43). Remove brushes (42) from motor.

(3) Remove screws (28) and washers (29). Take off rear motor yoke (27). Remove screws (23), washers (24), bearing retainer (22), washer (25) and bearing (26).

(4) Remove socket head screws inside brush inspection holes, which attach front motor yoke (49) to motor ring (71) and separate ring, armature (59) and yoke (49). Take nut (60), washers (36, 61 and 62), insulator (35) and leads (37-38) from yoke.

(5) Remove screws (70) to free pole pieces (69), insulators and field coils (66).

6-203. CLEANING. Clean parts as follows:

(1) Remove as much dirt as practical from parts with compressed air.

(2) Wipe remaining dirt from parts with a cloth slightly moistened with solvent. Do not wet armature or field windings.

(3) Clean commutators to bright finish with a commutator stone. Do not use emery cloth.

6-204. INSPECTION AND REPAIR. Proceed as follows:

(1) If balancing machine is available, check that armature dynamic balance is within 1 inch- ounce, at 3000 revolutions per minute.

(2) Measure commutator runout. If in excess of 0.002 inch total indicator reading, turn in lathe, truing commutator within above limits, and holding copper surface smoothness to less than 33 micro-inches. This finish may be obtained, after lathe turning, with a commutator stone.

(3) Check brush length of used brushes by comparing them with new brush. If brushes have less than one-half length of new brushes, replace them, as they probably will not last until next disassembly.

(4) Inspect bearings. Replace if necessary.

6-205. ASSEMBLY. Reverse procedures in paragraph 6-202.

6-206. TEST. Test as follows:

(1) Excite the field with rated current and voltage.

(2) Seat the brushes, and run the motor with low (6 or 12 volts DC) voltage on the armature terminals. Armature must now turn clockwise, viewed from cummutator end.

(3) After brushes have been seated and motor has run for four minutes, check bearing housings for head caused by motor yoke misalignment or bad bearings. Observe commutator and brushes for sparking at this time.

(4) Make a high potential test above ground on al windings, using a 115 volt AC test light.

6-207. HYDRAULIC PUMP MOTOR.

6-208. DISASSEMBLY. Clean motor exterior thorough with solvent, and disassemble as follows:

(1) Remove both covers (4, figure 7-15), remove scre (13) and washers, and take brushes (12) from motor.

(2) Remove screws (9) and take grease cap (8), retaini ring (11) and bearing (10) from end bell (39).

(3) Remove screws (40) and take front end bell (3 from motor housing (53).

(4) Remove nuts (23), washers (24 and 25), studs (2 and connectors (34 and 35), and insulators (27, 36, 22 an 38).

NOTE

> Tag wires to insure correct assembly and proper rotation of motor.

(5) Remove brush holders (16) and insulators (21 an 20).

(6) Remove screws (43) and retaining ring (46). Separa end bell (42) from motor housing (53). If bearing (4 remained in bell housing, remove.

(7) Remove armature (47) from motor housing. P bearing from shaft if necessary.

(8) Remove pole piece screws (51, pole pieces (50), strips (49) and fields (52).

6-209. CLEANING. Clean as follows:

(1) Remove as much dirt as practical from parts, with compressed air.

(2) Wipe remaining dirt from parts with a cloth slightly moistened with solvent. Do not wet armature or field windings.

(3) Clean commutator to bright finish with commutator stone. Do not use emery cloth.

6-210. INSPECTION AND REPAIR. Inspect and repair as follows:

(1) If balancing machine is available, check that armature dynamic balance is within one inch-ounce, at 3000 revolutions per minute.

(2) Measure commutator runout. If in excess of 0.002 inch total indicator reading, turn in lathe, truing commutator within above limits, and holding copper surface smoothness to less than 33 micro-inches. This finish may be obtained, after lathe turning, with commutator stone.

(3) Check brush length of used brushes by comparing them with new brush. If brushes have less than one-half length of new brushes, replace them, as they probably will not last until next disassembly.

(4) Make a high potential test above ground on all windings, using 115 volt test light or ohmmeter.

(5) With motor on test operation for five minutes, check for bearing heating, unusual noises from bearings or brushes, and for vibration.

(6) Watch action of brushes on commutator. Excessive sparking of brushes indicates worn or sticking brushes, weak brush springs, defective armature or commutator.

(7) Inspect area around commutator and brush covers for thrown solder from commutator, indicating that motor has been overheated in operation, or armature is shorted. If this condition is found, replace armature.

(8) Repair is limited to soldering loose solder joint connections, truing commutator in a lathe, and replacing defective parts.

6-211. ASSEMBLY. Reverse procedure in paragraph 6-207.

6-212. STEERING PUMP MOTOR.

6-213. DISASSEMBLY. Clean motor exterior thoroughly with solvent before beginning disassembly. Disassemble only as far as necessary, as follows:

(1) Relieve pressure of brush springs (8, **figure** 7-32) on brushes (15) and remove brushes.

CAUTION

Do not pull brushes out by leads if they might be serviceable. Leads may be damaged.

(2) Remove screws (3) from both end bells (1 and 2). Separate end yokes from field frame (14). Remove armature (13).

(3) Remove screws (16), washers (17), and remove brush holder (5) from commutator end bell. If they are to be replaced, pull bearings (9 and 10) from end bells.

(4) Remove screws, nuts and washers attaching terminal poles, and field windings (21, 22, 23 and 24), and remove poles and field windings.

6-214. INSPECTION. Inspect as follows:

(1) With motor on test operation for five minutes at 6 to 12 volts, check for bearing heating, unusual noises from bearings or brushes, and for vibration.

(2) Watch action of brushes on commutator. Excessive sparking of brushes indicates worn or sticking brushes, weak brush springs, defective armature or cummutator.

(3) Compare used brush length with a new brush from stock. If less than half length of new brush, install new brushes.

(4) Inspect area around commutator and brush covers for thrown solder from commutator, indicating that motor has been overheated in operation, or armature is shorted. If this condition is found, replace armature.

6-215. REPAIR. Repair is limited to soldering loose solder joint connections, truing commutator in a lathe, and replacing defective parts.

6-216. ASSEMBLY. Reverse procedures in paragraph 6-212.

6-217. TEST.

(1) With motor installed and pump connected for operation, disconnect one lead and connect an ammeter in series between the lead and the motor terminal from which the lead was disconnected.

(2) Operate motor and check for current draw of about 18 amperes unloaded (not steering) at truck battery voltage.

6-218. SC RELAY.

6-219. DISASSEMBLY. Disassemble only as far as necessary to perform necessary repairs, as follows:

(1) Disconnect all external leads to contactor.

(2) Remove snap switch (1, figure 7-7) from hinge bracket (11).

(3) Disconnect connector (7), remove retaining snap ring and take off rocker arm lever (25) with movable contact (20). Take contact from rocker arm lever. Take washer, timing actuator (28) from base assembly (29).

(4) Remove screws and take stationary contacts (15) from base (29).

(5) Remove screw which holds coil (42) to magnet frame (45). Remove coil.

6-220. ASSEMBLY. Assemble the contactor by reversing the disassembly steps.

6-221. FORWARD AND REVERSE RELAYS.

6-222. DISASSEMBLY. Disassemble contactor only as far as necessary to make repairs as follows:

(1) Disconnect all external leads.

(2) Disconnect connector (1, figure 7-8), remove snap ring and take off rocker arm lever (16). Remove both movable contacts (14).

(3) Take washer, timing actuator (19) from base (20).

(4) Remove screws, and take stationary contacts (9) from base.

(5) Remove screw which holds coil (33) to magnet frame (36) and remove coil.

6-223. ASSEMBLY. Assemble the contactor by reversing the disassembly procedure.

6-224. FIELD WEAKENING RELAY.

6-225. DISASSEMBLY. Disassemble only as far as required to perform needed repairs as follows:

(1) Disconnect all external leads to contactor.

(2) Remove connector (1, figure 7-9), and movable contact (14). Take off snap ring and take rocker arm lever (19) from base (23).

(3) Remove screw and take stationary contact (9) from base.

(4) Remove screw, and take coil (36) from magnet frame (39).

6-226. ASSEMBLY. Assemble the contactor by reversing the disassembly procedure.

6-227. MASTER SWITCH AND PUMP MOTOR RELAYS

a. General. All trucks have one pump contactor fitte with a circuit interlock which energizes the hourmeter. If truck has a second (optional) pump, the number two pum contactor will not have an interlock. Otherwise bot contactors will be the same.

6-228. DISASSEMBLY. Disassemble only as far a necessary to repair, as follows:

(1) Disconnect all external leads to contactor. Remov contactor only if necessary.

(2) To replace finger contact (figure 7-4), remove speci nuts and lock washers and remove contact tops.

(3) To replace coil (18), remove spring guide (14), spri (12) and armature (11). Take out screw above coil an remove two spring washers, pole face and assembly, an coil.

6-229. ASSEMBLY. Assemble contactor by reversing step above, observing the following recommendations.

6-230. STEERING RELAY.

6-231. DISASSEMBLY. Proceed as follows:

(1) Disconnect leads to contactor. Remove screw an washer (2, figure 7-6), and stationary contact (1).

(2) Remove nut (5) and insulator (10). Remove conta bar (4).

(3) Remove leads to coil (19). Remove nut (5) an screws (17), carefully lift interfering parts out of way an remove coil.

6-232. ASSEMBLY. Reverse procedure above.

6-233. ACCELERATOR CONTROL.

6-234. POTENTIOMETER REPLACEMENT. Proceed a follows: (figure 7-11).

(1) Remove potentiometer wires from terminal str (19).

(2) Loosen allen set screw (22) which secure potentiometer (21) to potentiometer drive and remov potentiometer.

(3) Before installing new potentiometer connect a ohmmeter or continuity tester between single terminal o top of potentiometer and center terminal of bottom thre terminals. Adjust potentiometer for minimum resistanc (ohmmeter) or maximum brightness (continuity tester).

(4) Install potentiometer and tighten allen set scre (Make sure tab on side of potentiometer is in notch o bracket). Recheck poter tiometer adjustment. Th potentiometer should exhibit minimum resistan

(ohmmeter) or maximum brightness (continuity tester) when in the neutral position.

6-235. CONTACTS. The contacts are silver and need only be replaced when worn thin. Do not file contacts; discoloration and slight pitting of the contacts is not harmful. When contacts need replacing, the contact module is replaced as a unit, along with its cam. Proceed as follows:

(1) Remove the module retaining screw (24), and remove the individual modules and cams, keeping the parts in order to facilitate reassembly.

(2) When reassembling, make sure the cams and contact modules are replaced in order. Also make sure the orientation of the index line on the cams and contact modules is the same as in the above diagram.

6-236. RETURN SPRING. Proceed as follows:

(1) To replace a broken return spring, proceed with the disassembly as in the contacts section.

(2) Gently pry off detent cam housing (35) and cover (33), and the spring return housing (26).

(3) Slide off the shaft bearing (36), spring drive (37) and defective spring (39).

(4) With the shaft oriented so the spring drive is directly opposite the detent cam housing (35) protrusion, slide the new return spring (39) on the shaft so that both spring ends are above the detent cam housing (35) protrusion.

(5) Using a screwdriver, load the spring by placing the top end of the return spring below the detent cam housing protrusion. Replace the spring drive (37) so its hub is adjacent to the detent cam protrusion.

(6) Replace the shaft bearing (36), spring return housing (26), detent module and cover.

6-237. DIRECTIONAL CONTROL SWITCH.

6-238. DISASSEMBLY. Proceed as follows:

(1) Remove cover (11, figure 7-12) attached with two screws (12), washers (13), and liner (14).

(2) Remove screws attaching sensitive switches (18) to bracket (19) and remove switches.

(3) Remove screws holding housing bracket. Remove housing bracket (10).

(4) Remove springs (20). Remove two clips (22) attached with screws, and remove pins (21) and arm assemblies (23).

(5) Remove screw and washers securing carrier assembly to shaft (24). Remove shaft and spacer (26) from housing (28).

6-239. ASSEMBLY. Reverse disassembly procedures.

6-240. ELECTRICAL CONTROL ADJUSTMENTS.

6-241. GENERAL. The SCR control pack which controls creep speed, acceleration time, the shorting contactor time delay, current limit, and plugging severity is adjusted for each truck during manufacture. Replacement of control components or motors may require readjusting of the control pack (7, figure 7-10) for proper truck operation. Adjustment may also be required when the nature of operation or type of materials handled change. The change from a lead-acid to a nickel-iron alkaline battery will require adjustment (para 6-250).

6-242. ADJUSTMENTS. The SCR control pack cover is removed and exposes five trimmers. Clockwise rotation will provide an increase in the function being adjusted and counterclockwise a decrease. The SCR trimmers provide fifteen turns to go from one end of the trimmer range to the other. At each end the adjusting screw will "slip" to prevent damage to the threads. The field weakening pack (20, figure 7-3) is provided with drop-out and pick-up single turn trimmers, each having a locknut.

NOTE

Make all adjustments except where noted in the following sequence. Adjustments must be made with a fully charged battery.

6-243. PREPARATION OF TRUCK. Make adjustments to the electrical control circuits as follows:

(1) Raise drive wheels of truck off floor. Support securely.

(2) Remove rear control panel cover (para 6-28).

(3) Remove the SCR control pack cover (7, figure 7-10).

(4) Disconnect the heavy cable connecting the hydraulic pump relay 1MP (2, figure 7-3) and the shorting contactor SC relay (17). Connect a DC ammeter and a shunt between the end of the removed cable and the terminal from which it was removed.

(5) Remove truck floor plate (para 6-27).

(6) Disconnect wiring harness at the master cylinder brake light switch (9, figure 7-29) connector plug. The plug contacts are arranged in two rows of three contacts. Connect, with a jumper wire, the outer contacts of one row in the harness end plug. With all switches in operating position, check for stoplight. If stoplight lights, remove jumper and connect to outer contacts of other row. The jumper in correct location will lock out the brake switch in the travel motor circuit.

NOTE

If wire harness leads are numbered, jump wire 70 to wire 94. See wiring schematic (figure 4-1).

6-244. FIELD WEAKENING ADJUSTMENT.

a. Field weakening provides for maximum truck speed and is controlled through the shorting contactor SC relay (17, figure 7-3).

b. Field weakening relay is adjusted to operate at the following amperes:

(1) Relay closes (pick-up) 125 to 150 amperes.

(2) Relay opens (drops out) 350 to 365 amperes.

c. Adjust for pick-up and drop-out as follows:

(1) With direction control in forward direction, depress accelerator pedal slowly until two clicks of the shorting contactor SC (17) and the field weakening FW (19) relays are heard or the contacts are seen to close. Hold this accelerator position.

(2) Gently apply foot service brake while holding motor speed until the field weakening relay drops out. Note current draw on ammeter.

(3) If not 350 to 365 amperes, release both brake and accelerator.

(4) Adjust field weakening pack (20) drop-out trimmer (figure 6-2). Loosen locknut and turn clockwise to decrease current draw. Lock locknut.

(5) Repeat steps above until drop-out is correct.

(6) Again accelerate until the SC and FW relays close and gently apply brake until FW relay drops out.

(7) Gradually release brake until the FW relay picks up and note current draw on ammeter.

(8) If not 125 to 150 amperes, release both brake and accelerator.

(9) Adjust field weakening pack pick-up trimmer (figure 6-2) similar to (4) above.

CAUTION

Avoid excessive operation of loading motor by applying service brakes with the brake switch jumped. This will cause extreme motor heat and excessive wear of brake lining.

6-245. CURRENT LIMIT ADJUSTMENT.

a. The current limit prevents excess current from damaging the system. The limit must be adjusted whe changing from a lead-acid to a nickel-iron alkaline battery See para 6-251.

b. The current limit must be adjusted to a maximum of 200 amperes.

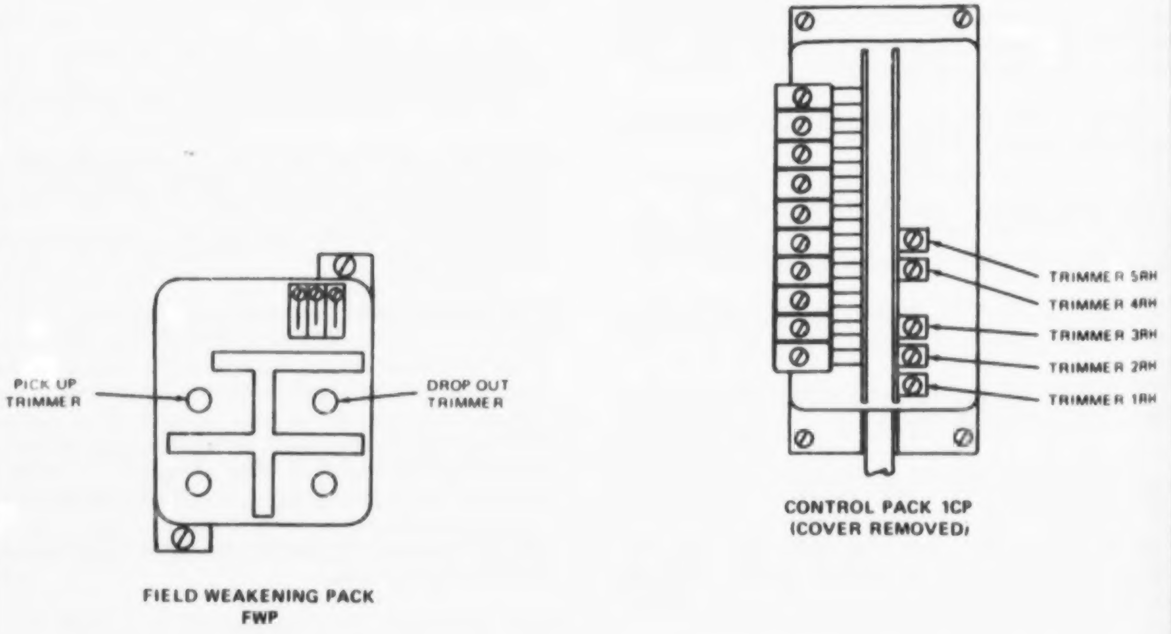


Figure 6-2. Electrical Control Trimmer Locations

c. Adjust the current limit as follows:

(1) Prepare truck according to para 6-243.

(2) Disconnect wire No. 5 from the No. 5 terminal of the anti-rollback pack ARP (12, figure 7-3).

(3) With direction control in forward position, depress accelerator fully until maximum speed is obtained and hold position.

(4) Gently apply foot service brake until drive motor stalls. Note current draw on ammeter.

(5) If reading is not 200 amperes, adjust the SCR control pack No. 4RH trimmer (figure 6-2) clockwise to increase amperes to 200 or counterclockwise to decrease limit.

(6) Repeat steps 3, 4 and 5 above until correct setting is obtained.

(7) Remove ammeter and shunt. Connect cable removed in para 6-243(4). Remove brake switch jumper and connect plugs. Attach floor.

6-246. CREEP SPEED. Adjust as follows:

(1) Place direction control in either forward or reverse position and lightly depress accelerator until forward or reverse relays (18, figure 7-3) just close.

(2) If truck fails to move on level floor, adjust the SCR control pack No. 1RH trimmer (figure 6-2) clockwise until truck begins to move.

(3) If truck moves too fast, adjust trimmer counterclockwise.

6-247. ACCELERATION TIME.

a. The acceleration time is that time required for the truck to progress in speed from a standstill to the maximum SCR controlled speed.

NOTE

> The maximum unloaded forward speed is 5.8 mph when the shorting contactor and field weakening pack are connected.

b. Acceleration time is adjusted to provide 22 feet of forward movement from standstill in 6 seconds.

c. Adjust acceleration rate as follows:

(1) Using a watch with a sweep second hand or stop watch, accurately time the time required to travel 22 feet. From standstill with direction control in forward position, depress accelerator fully.

NOTE

> Truck may reach maximum SCR controlled speed prior to covering 22 feet.

(2) Run test several times to get accurate reading if necessary.

(3) To reduce time to cover 22 feet, faster acceleration, rotate SCR control pack No. 2RH trimmer (figure 6-2) counterclockwise.

(4) To increase time, slower acceleration, rotate trimmer clockwise.

(5) Reconnect wire No. 5 to the No. 5 terminal of the anti-rollback pack (12, figure 7-3) removed in para 6-245.

6-248. SHORTING CONTACTOR TIME DELAY.

a. The shorting contactor time delay is required to provide a fraction of a second delay between the point of maximum SCR speed control range and when the circuitry switches to the field weakening pack for maximum speed. The shorting contactor also cuts out the SCR controlled acceleration.

b. The shorting contactor relay (17, figure 7-3) is adjusted to close in approximately the same time that was established for acceleration time (para 6-247).

NOTE

> For smooth operation of truck, the shorting contactor time delay should never be set to a value less than the acceleration time.

c. Adjust time delay as follows:

(1) Rotate SCR control pack No. 3RH trimmer (figure 6-2) fully clockwise until the screw slips.

(2) Operate truck full speed forward and observe when shorting contactor closes. The relay will snap with a loud snap, followed immediately by the field weakening relay pick-up.

(3) Rotate trimmer counterclockwise in small steps and repeat (2) above.

(4) Continue adjusting until shorting contactor relay closes in approximately the same time that was derived in the acceleration time adjustment.

6-249. PLUGGING SEVERITY.

a. Plugging is the act of switching the direction control while moving in one direction at maximum speed without use of the service brakes. In plugging, the motor will act as a braking force.

b. Adjustment is made for feel of operation.

c. Adjust plugging severity as follows:

(1) Operate the truck at a maximum forward speed. If previous adjustments (para 6-244 through 6-248) have been properly made, truck will come to maximum speed smoothly.

(2) Move direction control lever (82, figure 7-2) to reverse position without releasing accelerator or applying service brakes. Determine severity of direction change.

(3) If plugging reaction is too severe, adjust SCR control pack No. 5RH trimmer (figure 6-2) counterclockwise to reduce severity. If plugging is too soft, adjust clockwise. Repeat step (2) above until correctly adjusted.

(4) Replace SCR control pack cover and control panel cover.

6-250. INDIVIDUAL ADJUSTMENTS. When necessary, any one or more of above adjustments can be made without completing the complete sequence. The following chart is a summary of adjustment steps and preparation required (para 6-243).

6-251. BATTERY TYPES.

6-252. GENERAL. This truck may be operated from either a lead-acid or nickel-iron alkaline battery. Either battery will provide the required voltage but due to its construction and materials, the current limit must be calibrated for the type battery installed. The current output of the nickel-iron alkaline battery will not provide sufficient current to satisfactorily operate the truck that has been calibrated and run on a lead-acid battery. Conversely, a lead-acid battery installed in the truck calibrated and run from a nickel-iron alkline battery will pass excessive current. The current limit must be set for a maximum of 200 amperes for either battery. Excess current will cause a lurch in speed as the acceleration passes from the SCR controlled acceleration to the field weakening controlled maximum speed.

CAUTION

> Replace the battery with a similar battery or recalibrate current limit (para 6-245) to prevent truck lurch. Excess current may also damage the SCR control pack.

6-253. BATTERY DESCRIPTION. Batteries differ in appearance as follows:

a. Lead-Acid Battery. The lead-acid battery is constructed with all cells built into one case. The battery case top is filled and sealed between the cells.

b. Nickel-Iron Alkaline Battery. This battery is composed of individual separate cells arranged in a carrying tray or case. Each cell is joined by a connecter cable with cells hooked in series. Cells are separated from each other within the case.

6-254. BATTERY COMPARTMENT. Each truck is constructed with battery clamps welded to the truck in a location permitting installation of only one type battery. If the battery is to be changed to the other style, the brackets must be relocated.

6-255. DEFECTIVE MATERIAL. Return unserviceable items to supporting maintenance units for determination of feasibility of action under warranty.

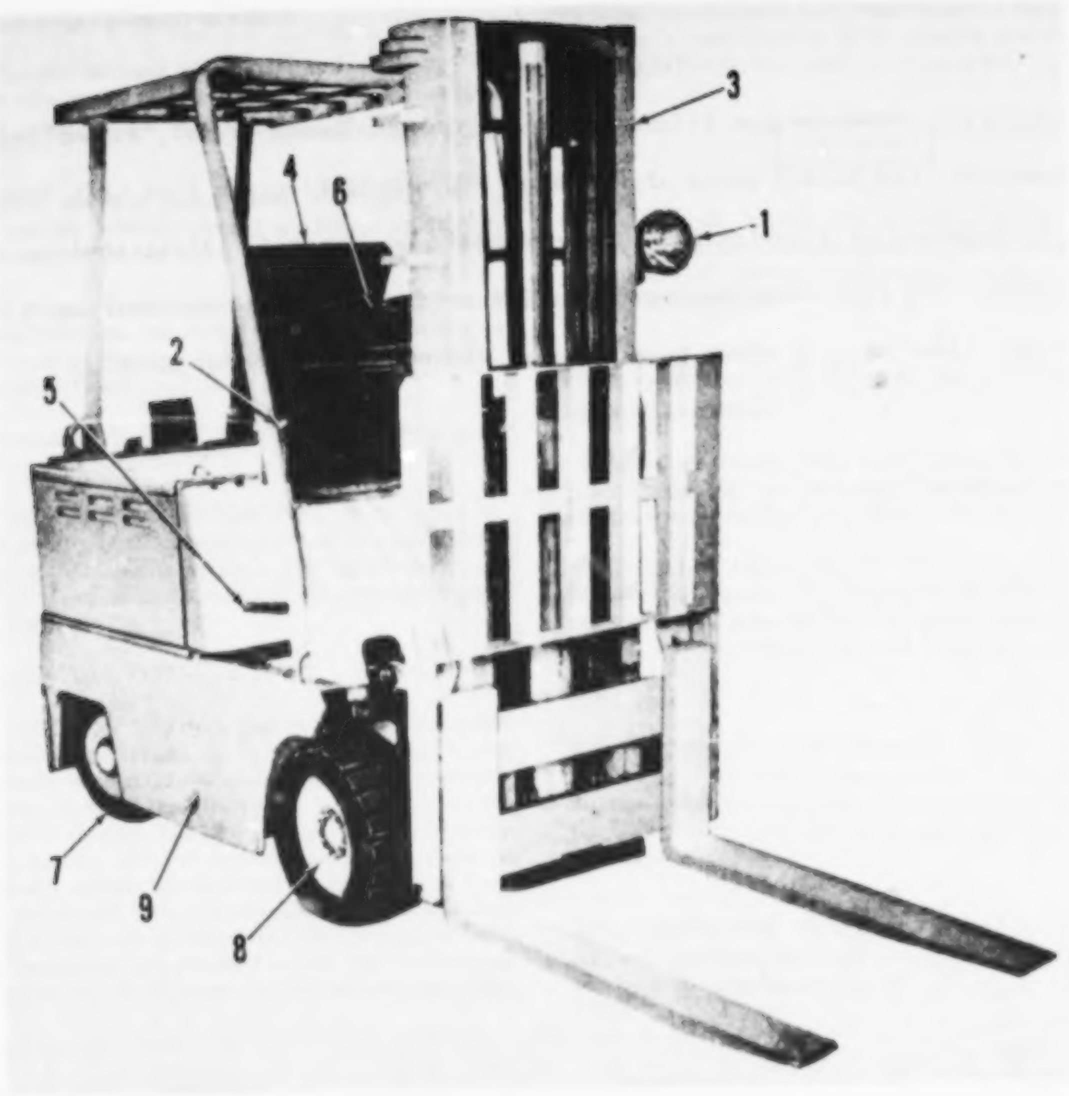
	Adjustment	Preparation	Para Ref
1.	Field Weakening	a. Lift drive axle b. Connect ammeter and shunt c. Jump brake switch	6-244
2.	Current Limit	a. Lift drive axle b. Connect ammeter and shunt c. Jump brake switch d. Disconnect ARP no. 5 lead	6-245
3.	Creep Speed	a. Disconnect ARP no. 5 lead b. Operate truck	6-246
4.	Acceleration Time	a. Disconnect ARP no. 5 lead b. Operate truck	6-247
5.	Shorting Contactor Time Delay	a. Operate truck	6-248
6.	Plugging	a. Operate truck	6-249

SECTION 7

ILLUSTRATIONS

7-1. General. This section illustrates the major equipment groups, assemblies, subassemblies, and detail parts of the Model FTD-040-EE Electric Fork Lift Truck.

7-2. Arrangement of Illustrations. The complete equipment is illustrated in figure 7-1. The list accompanying figure 7-1 refers (by figure numbers) to subsequent illustrations where breakdowns of the equipment may be found.



INDEX NO.	DESCRIPTION	FIGURE NO.
1	Electrical System	2 thru 12
2	Hydraulic System	13 thru 22
3	Uprights, Backrest, Fork and Carriage Arrangement	23 thru 26
4	Seat, Individual	27
5	Mechanical Controls Arrangement	28 thru 29
6	Steering	30 thru 33
7	Steering Axle Arrangement	34
8	Drive Axle, Adapter, Drive Motor, Wheels and Tires	35 thru 37
9	Body and Chassis Arrangement	38

Figure 7-1. Model FTD-040-EE, 4000 Pound Capacity, Fork Lift Truck

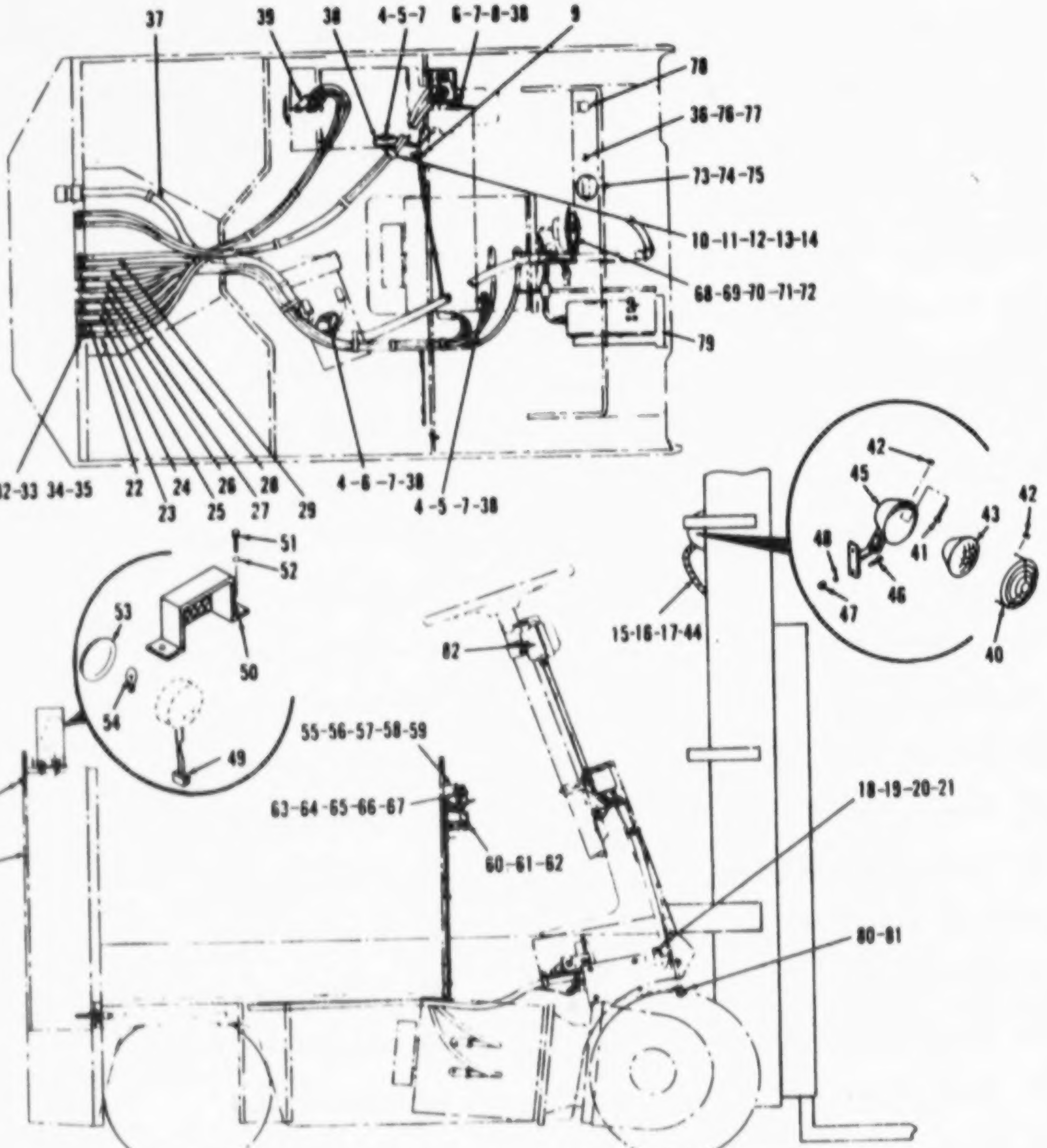

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Figure 7-2. Electrical System Arrangement

Key to figure 7-2

1	Panel, electric control
2	Screw, tapping
3	Washer, lock
4	Clamp
5	Screw, machine
6	Nut, plain, hex
7	Washer, lock
8	Clamp, loop
9	Nut, plain, hex
10	Washer, lock
11	Clamp, loop, lead attaching
12	Nut, plain, hex
13	Washer, lock
14	Washer, flat
15	Clamp, loop
16	Nut, flat
17	Washer, flat
18	Clamp, loop
19	Screw, cap, hex head
20	Nut, plain, hex
21	Washer, lock
22	Lead, electrical
23	Lead, electrical
24	Lead, electrical
25	Lead, electrical
26	Lead, electrical
27	Lead, electrical
28	Lead, electrical
29	Lead, electrical
30	Nut, plain, hex
31	Washer, lock
32	Washer, flat
33	Insulator
34	Insulator
35	Insulator
36	Lead, electrical
37	Wiring harness
38	Relay, thermal
39	Bonnet
40	Guard, headlight
41	Screw, cap, hex head
42	Nut, plain, hex
43	Lamp incandescent
44	Cable assembly
45	Housing, lamp
46	Screw, cap, hex head
47	Nut, plain, hex
48	Washer, lock
49	Connector, plug
50	Guard

Key to figure 7-2 (cont'd)

51 Screw, tapping
52 Washer, lock
53 Lens
54 Lamp, incandescent
55 Connector, plug
56 Screw, cap, hex head
57 Washer, lock
58 Housing, plunger
59 Plunger
60 Switch, sensitive
61 Screw, machine
62 Washer, lock
63 Bracket
64 Screw, cap
65 Nut, plain, hex
66 Washer, lock
67 Insulator
68 Tubing,
69 Suppressor
70 Horn, electrical
71 Screw, cap
72 Washer, lock
73 Clamp, suppressor
74 Suppressor
75 Meter
76 Switch, toggle
77 Plate
78 Switch, push
79 Switch assembly
80 Screw, cap, hex head
81 Washer, lock
82 Switch assembly

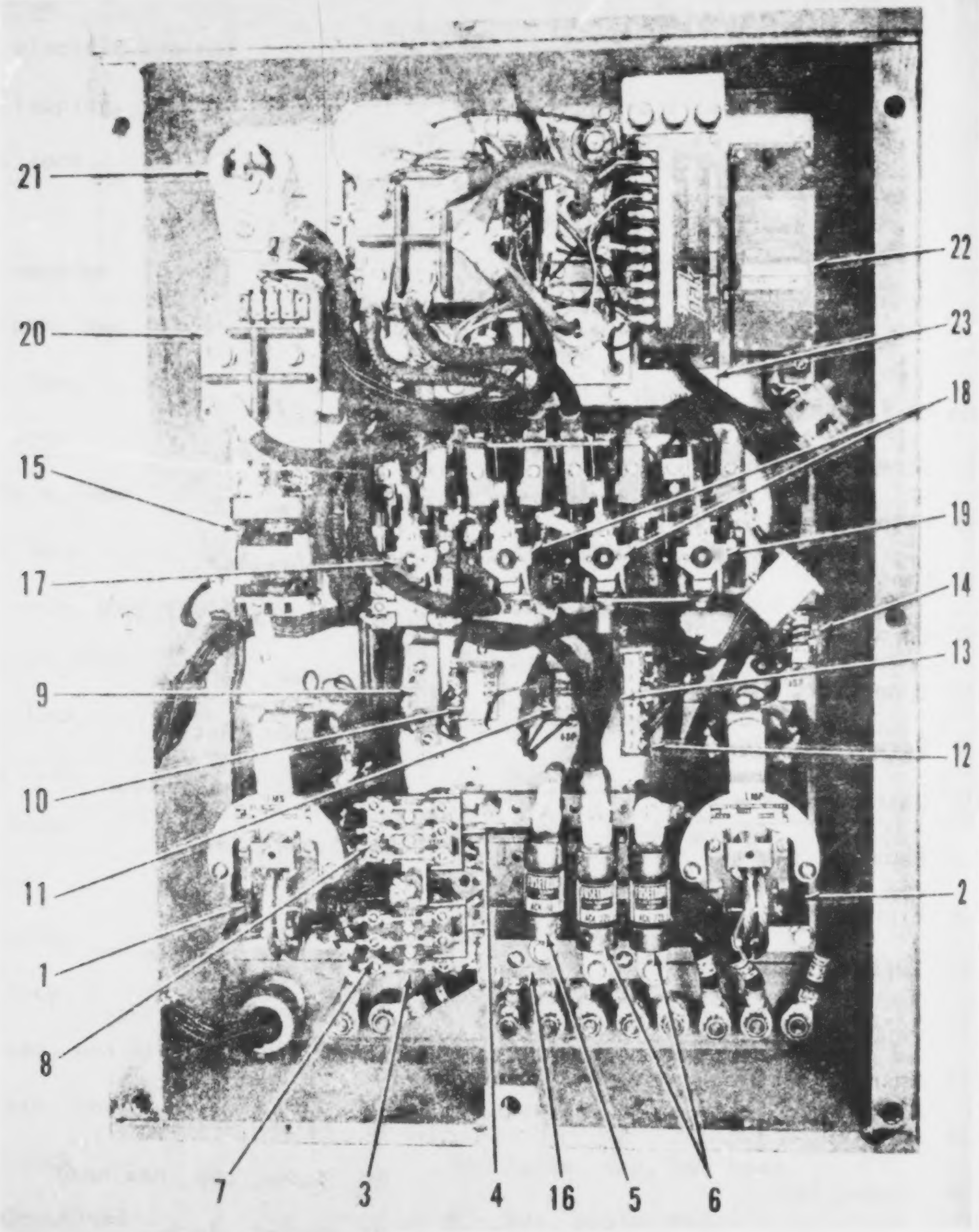
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Figure 7-3. Panel, Electric Control

Key to figure 7-3

1	Relay armature
2	Relay, armature
3	Fuse, cartridge
4	Fuse, cartridge
5	Fusetron
6	Fusetron
7	Fuseholder
8	Bracket
9	Resistor
10	Engine hour pack
11	Capacitor
12	Anti-rollback pack
13	Barrier
14	Capacitor
15	Relay, armature
16	Bus bar
17	Relay, armature
18	Relay, armature
19	Relay, armature
20	Field weakening pack
21	Resistor
22	Control pack
23	Power panel

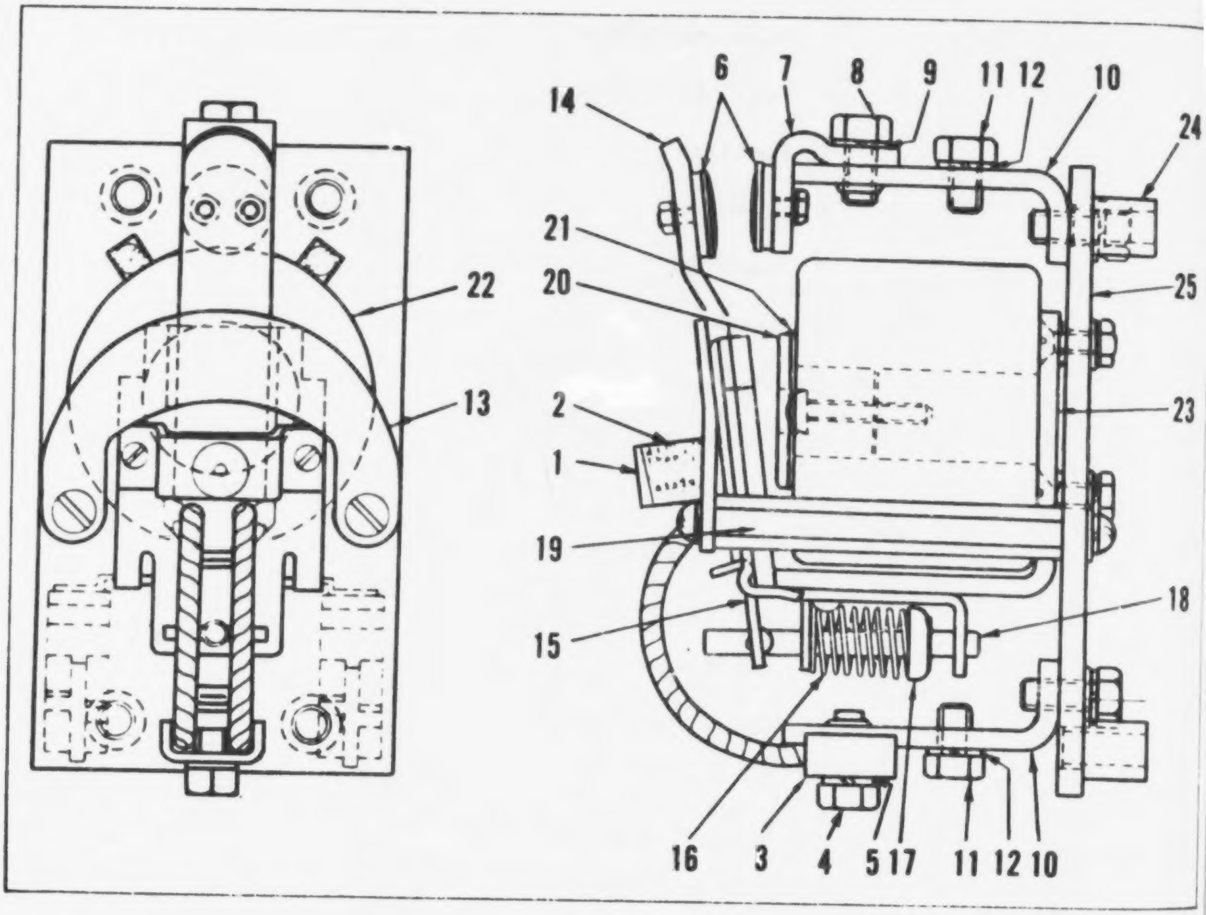
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Figure 7-4. Relay Armature, IMS

Key to figure 7-4

1 Guide, spring

2 Spring, helical

3 Clip, flex connector

4 Screw, cap, hex head

5 Washer, lock

6 Contact, electrical

7 Support, stationary contact

8 Screw, cap, hex head

9 Washer, lock

10 Post, contact

11 Screw, cap

12 Washer, lock

13 Stop, contact

14 Finger, contact

15 Armature, relay

16 Spring, helical

17 Washer

18 Guide

19 Post, contact stop

20 Pole face assembly

21 Washer

22 Coil, relay

23 Frame assembly

24 Spacer, panel

25 Panel assembly

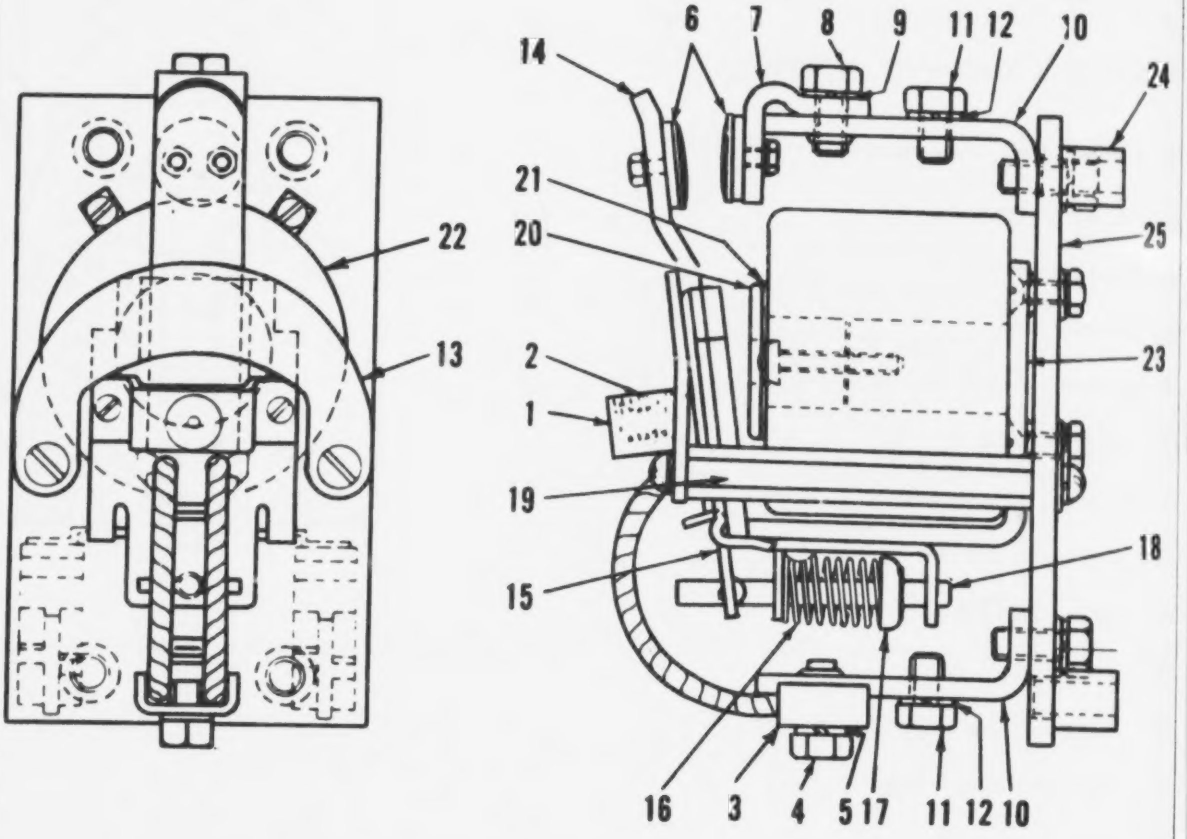
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Figure 7-5. Relay, Armature, IMP

Key to figure 7-5

1	Guide, spring
2	Spring, helical
3	Clip, flex connector
4	Screw, cap, hex head
5	Washer, lock
6	Contact, electrical
7	Support
8	Screw, cap, hex head
9	Washer, lock
10	Post, contact
11	Screw, cap, hex head
12	Washer, lock
13	Stop, contact
14	Finger, contact
15	Armature, relay
16	Spring, helical
17	Washer, cup
18	Guide, return spring
19	Post, contact stop
20	Pole face assembly
21	Washer
22	Coil, relay
23	Frame assembly
24	Spacer, panel
25	Panel assembly

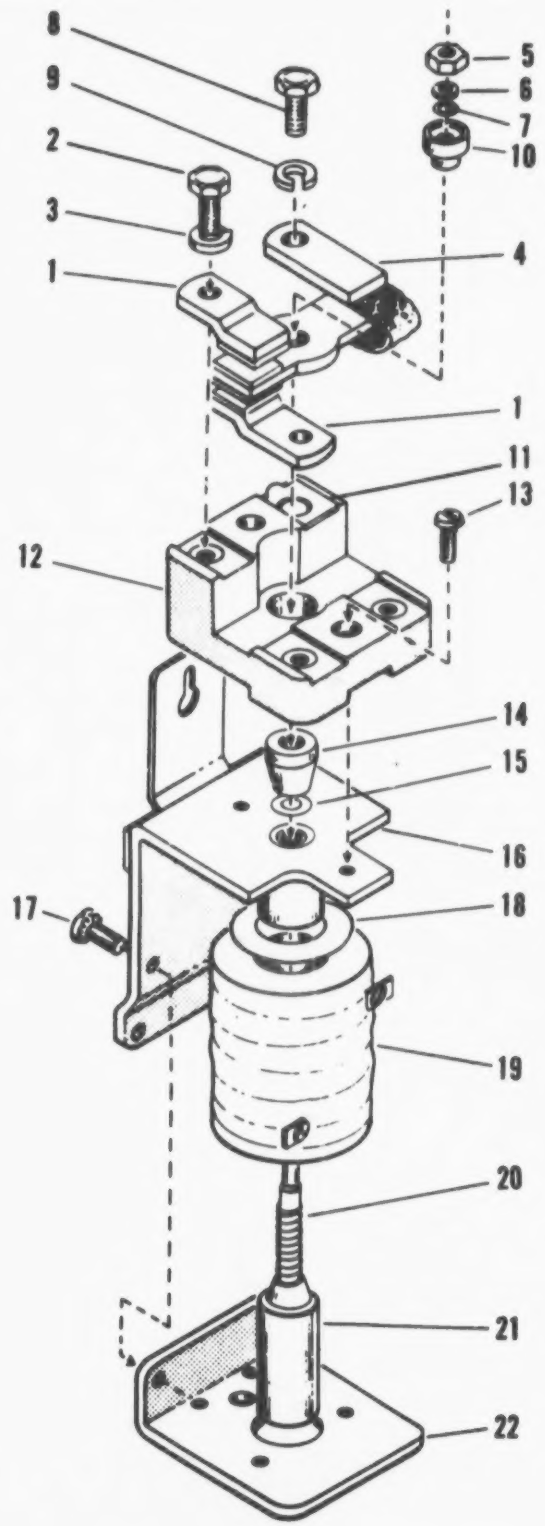
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Figure 7-6. Relay, Armature, 1S

Key to figure 7-6

1 Contact, electrical

2 Screw, cap, hex head

3 Washer, lock

4 Contact bar assembly

5 Nut, plain, hex

6 Washer, lock

7 Washer, flat

8 Screw, cap

9 Washer, lock

10 Bushing, insulator

11 Lug, bottom

12 Block assembly, contact

13 Screw, assembled washer

14 Bushing, insulator

15 Washer, armature rod

16 Frame assembly

17 Screw, assembled washer

18 Washer

19 Coil, relay

20 Spring, helical

21 Plunger assembly

22 Plate, bottom

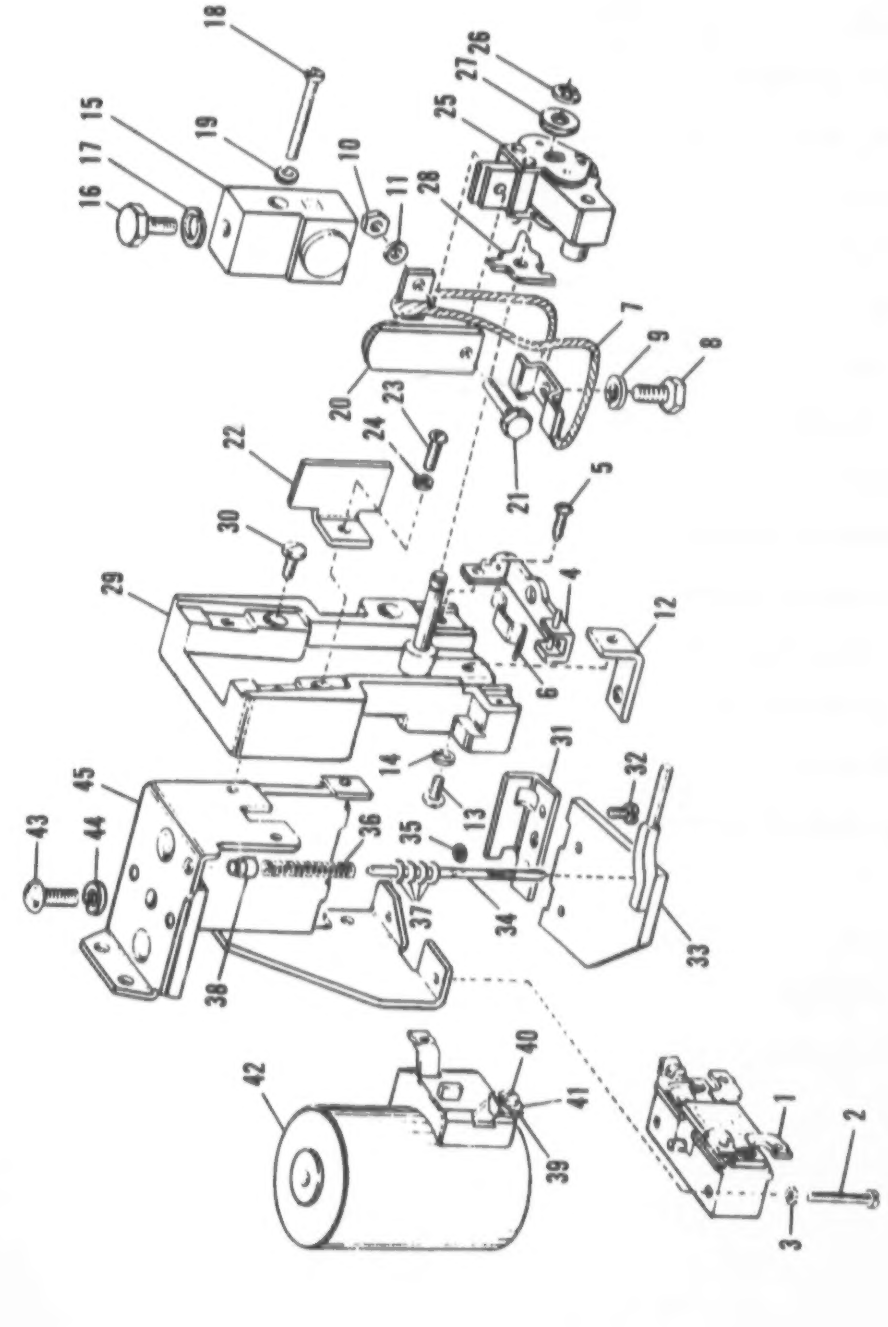
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Figure 7-7. Relay, Armature SC

Key to figure 7-7

1 Switch, sensitive, interlock

2 Screw, machine

3 Washer, lock

4 Hinge bracket and pin

5 Screw, tapping

6 Lever, operator, switch

7 Connector, flexible

8 Screw

9 Washer, lock

10 Nut, plain, hex

11 Washer

12 Support, flexible connector

13 Screw, machine

14 Washer, lock

15 Contact, electrical

16 Screw, contact

17 Washer, lock

18 Screw, machine

19 Washer, lock

20 Contact electrical

21 Screw, moveable

22 Stop, moveable contact

23 Screw, machine

24 Washer, lock

25 Arm assembly, rocker

26 Ring, retaining

27 Washer, flat

28 Actuator, interlock

29 Base assembly

30 Screw, machine

31 Hinge, moveable

32 Screw, machine

33 Arm and crank assembly

34 Rod, push

35 Ring retaining

36 Spring, helical

37 Shim, push rod

38 Bushing, push rod

39 Clamp, wire, coil

40 Screw, machine

41 Washer, lock

42 Coil, relay

43 Screw, machine

44 Washer, lock

45 Frame assembly

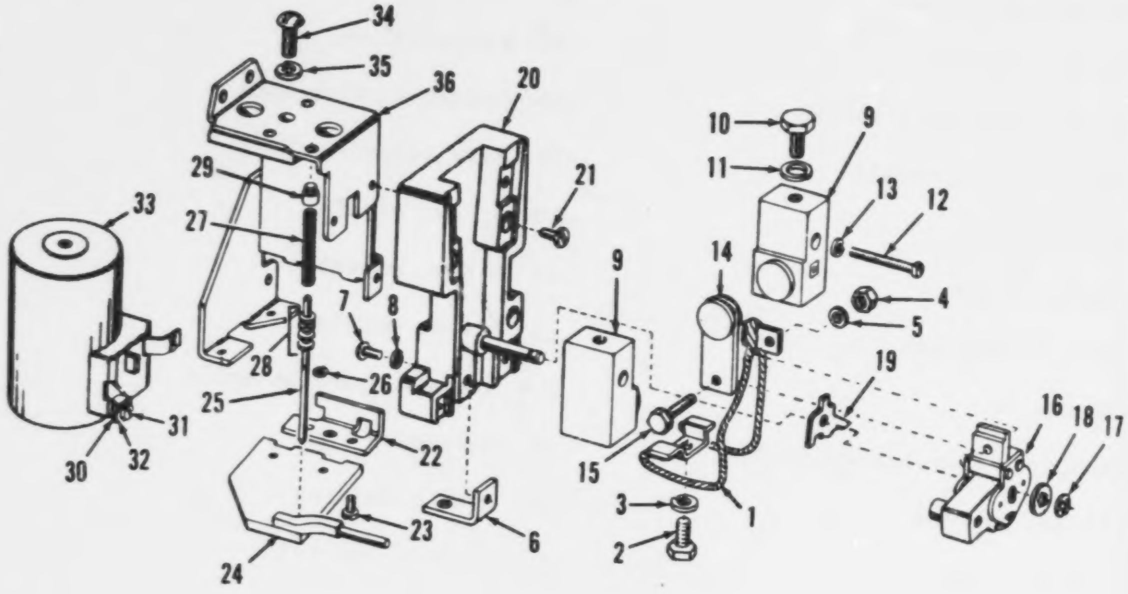
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Figure 7-8. Relay, Armature, Forward and Reverse

Key to figure 7-8

1	Connector, flexible
2	Screw
3	Washer, lock
4	Nut, plain, hex
5	Washer, spring tension
6	Support, flexible
7	Screw, machine
8	Washer, lock
9	Contact, electrical
10	Screw, contact
11	Washer, lock
12	Screw, machine
13	Washer, lock
14	Contact, electrical
15	Screw, moveable
16	Arm assembly, rocker
17	Ring, retaining
18	Washer, flat
19	Actuator, interlock
20	Base assembly
21	Screw, machine
22	Hinge, moveable
23	Screw, machine
24	Arm and crank assembly
25	Rod, push
26	Ring, retaining
27	Spring, helical
28	Shim, push rod
29	Bushing, push rod
30	Clamp, wire coil
31	Screw, machine
32	Washer, lock
33	Coil, relay
34	Screw, machine
35	Washer, lock
36	Frame assembly

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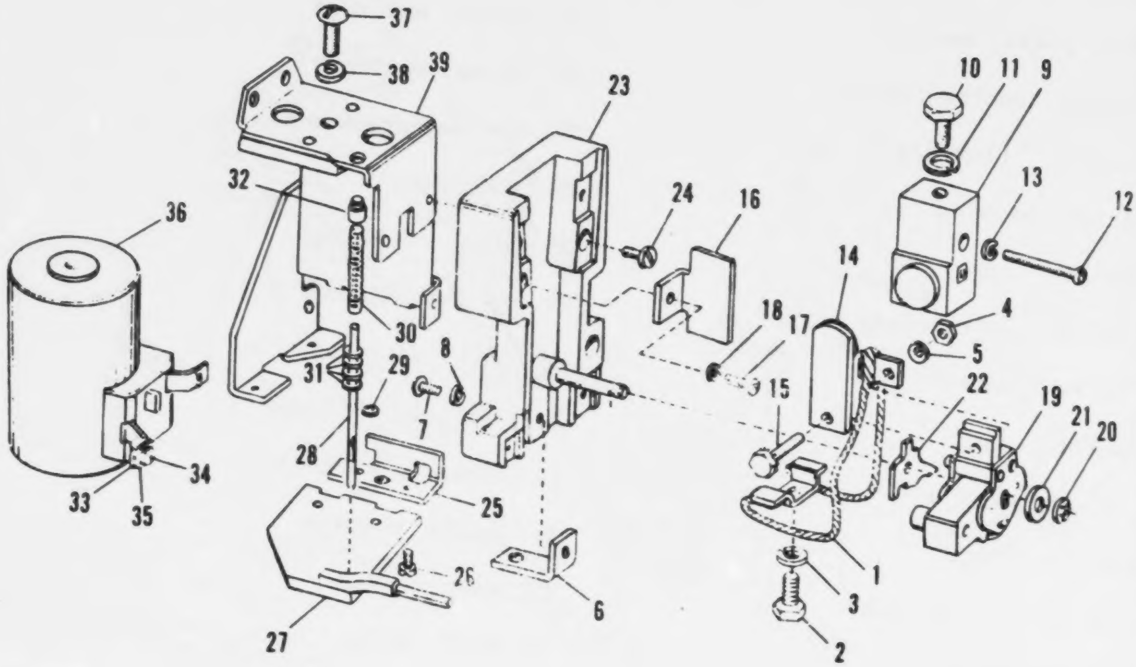
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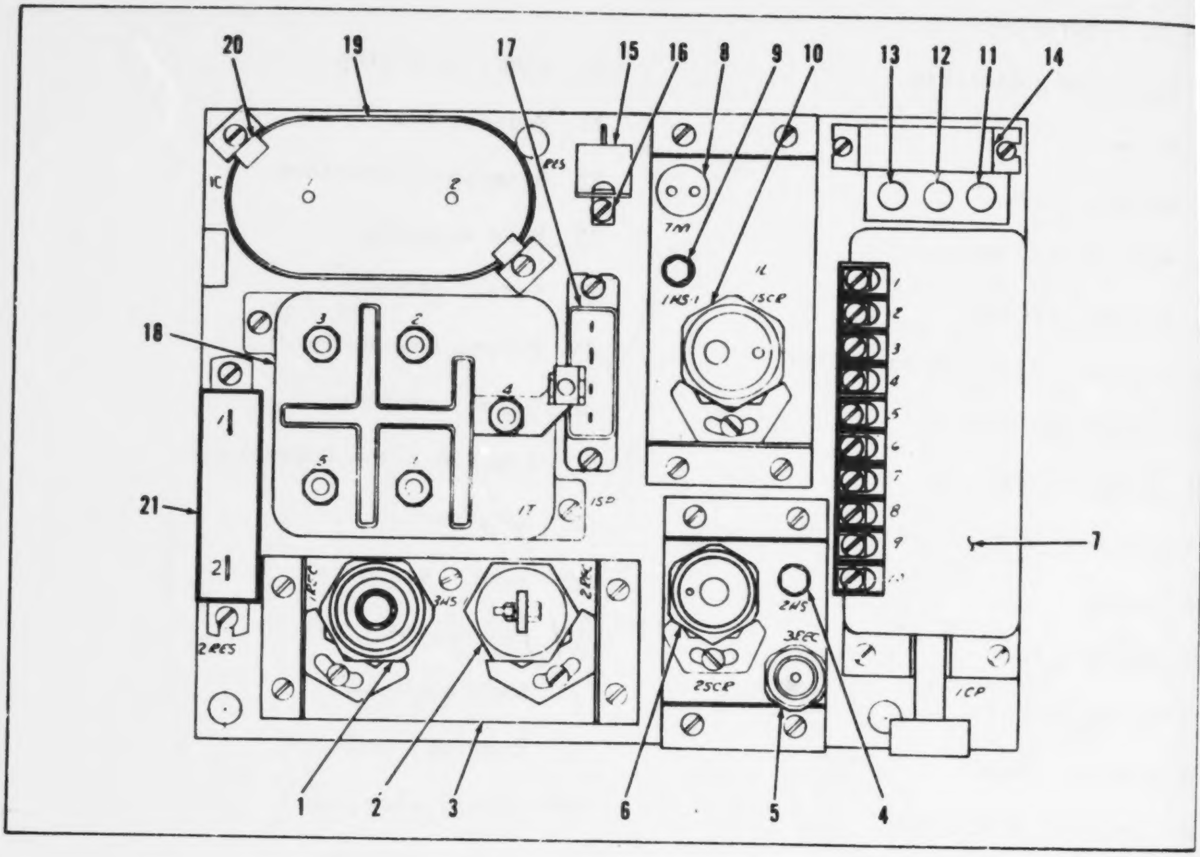
Figure 7-9. Relay, Armature, Field Weakening

Key to figure 7-9

1 Connector, flexible
2 Screw
3 Washer, lock
4 Nut, plain, hex
5 Washer, spring
6 Support, flexible connector
7 Screw, machine
8 Washer, lock
9 Contact, electrical
10 Screw
11 Washer, lock
12 Screw, machine
13 Washer, lock
14 Contact, electrical
15 Screw
16 Stop, moveable contact
17 Screw, machine
18 Washer, lock
19 Arm assembly, rocker
20 Ring, retaining
21 Washer, flat
22 Actuator, interlock
23 Base assembly
24 Screw, machine
25 Hinge, moveable
26 Screw, machine
27 Arm and crank assembly
28 Rod, push
29 Ring, retaining
30 Spring, helical
31 Shim push rod
32 Bushing, push rod
33 Clamp, wire, coil
34 Screw, machine
35 Washer, lock
36 Coil, relay
37 Screw machine
38 Washer, lock
39 Frame assembly, magnet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2RES
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2SCR
3REC
2HS
1CP
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Figure 7-10. Power panel, SCR

Key to figure 7-10

1	Semiconductor device
2	Semiconductor device
3	Heat sink
4	Heat sink
5	Semiconductor device
6	Semiconductor device
7	Control pack
8	Thermistor
9	Heat sink
10	Semiconductor device
11	Fuse, cartridge
12	Fuse, cartridge
13	Fuse, cartridge
14	Suppressor
15	Resistor
16	Bracket
17	Suppressor
18	Transformer
19	Capacitor
20	Bracket, capacitor
21	Resistor

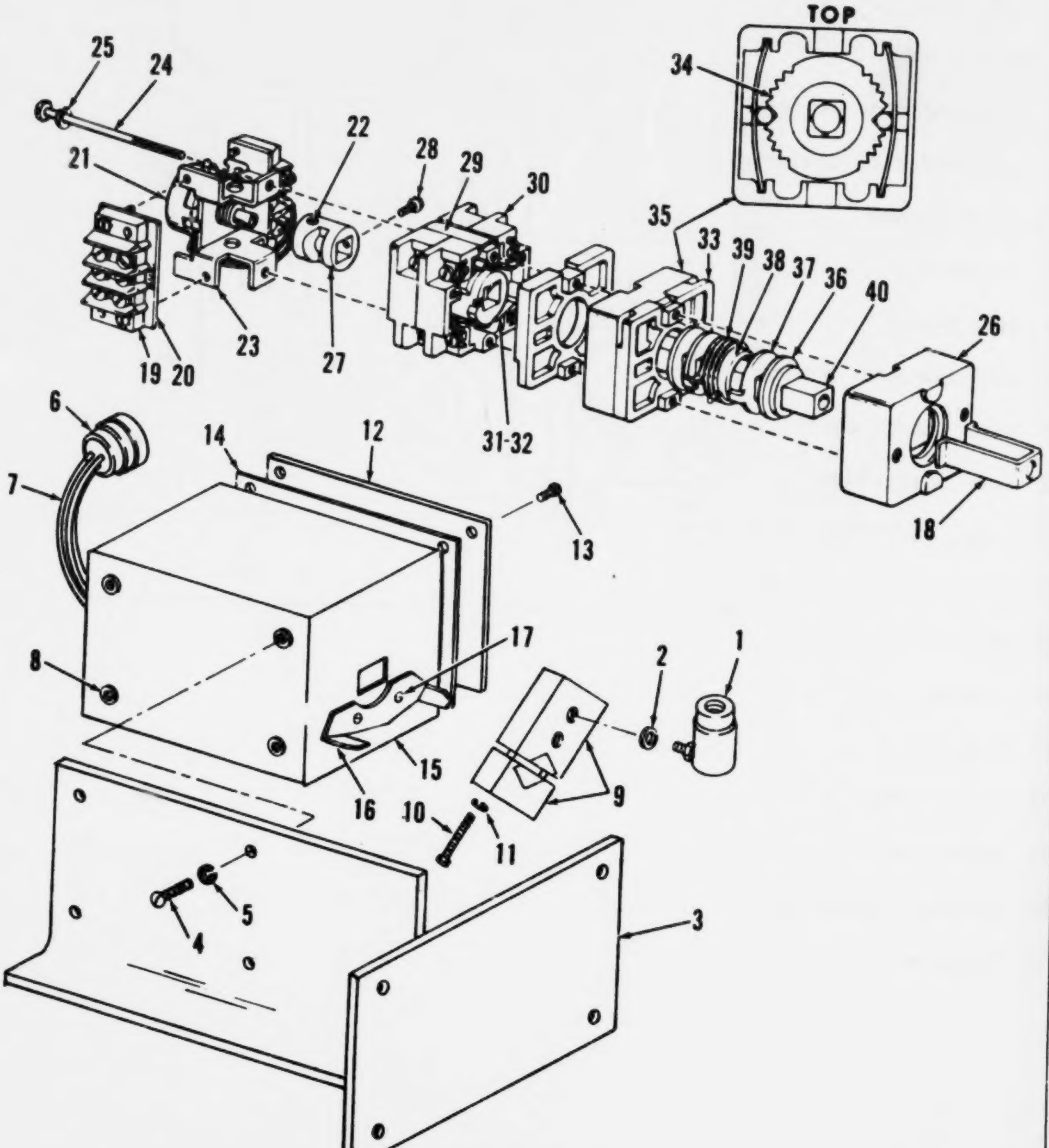

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Figure 7-11. Switch Assembly, Accelerator Control

Key to figure 7-11

1 Ball joint, rod end
2 Washer, lock
3 Bracket, accelerator switch
4 Screw, machine
5 Washer, lock
6 Connector, receptacle
7 Wiring harness
8 Rivnut, enclosure mounting
9 Arm, operating
10 Screw, machine
11 Washer, lock
12 Cover, enclosure
13 Screw, machine
14 Gasket, cover
15 Enclosure
16 Bracket, mounting
17 Screw, machine
18 Retainer, shaft
19 Terminal Board
20 Barrier
21 Potentiometer assembly
22 Setscrew
23 Bracket, potentiometer mounting
24 Screw, machine
25 Washer, lock
26 Housing, spring return
27 Drive coupling potentiometer
28 Screw, machine
29 Strip, marker
30 Contact assembly
31 Cam
32 Cam
33 Cover, detent housing
34 Cam, detent
35 Housing, detent cam
36 Bearing, shaft
37 Drive, spring
38 Support, spring
39 Spring, return
40 Shaft

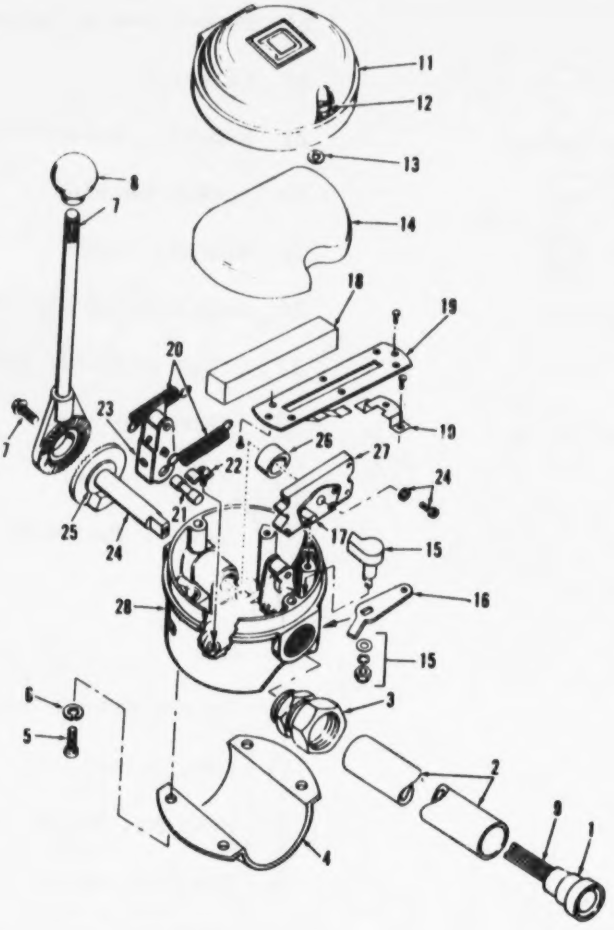
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Figure 7-12. Switch Assembly, Directional Control

Key to figure 7-12

1 Connector, receptacle

2 Conduit, electrical

3 Connector, conduit

4 Clamp, direction control switch

5 Screw, cap

6 Washer, lock

7 Handle assembly

8 Knob, operating handle

9 Wiring harness

10 Bracket, housing

11 Cover

12 Screw, machine

13 Washer

14 Liner, cover

15 Shaft assembly

16 Lever, trip

17 Operating lever

18 Switch

19 Bracket

20 Spring, helical

21 Hinge pin

22 Clip

23 Arm assembly

24 Shaft assembly

25 Washer

26 Spacer

27 Carrier assembly

28 Housing and bearing assembly

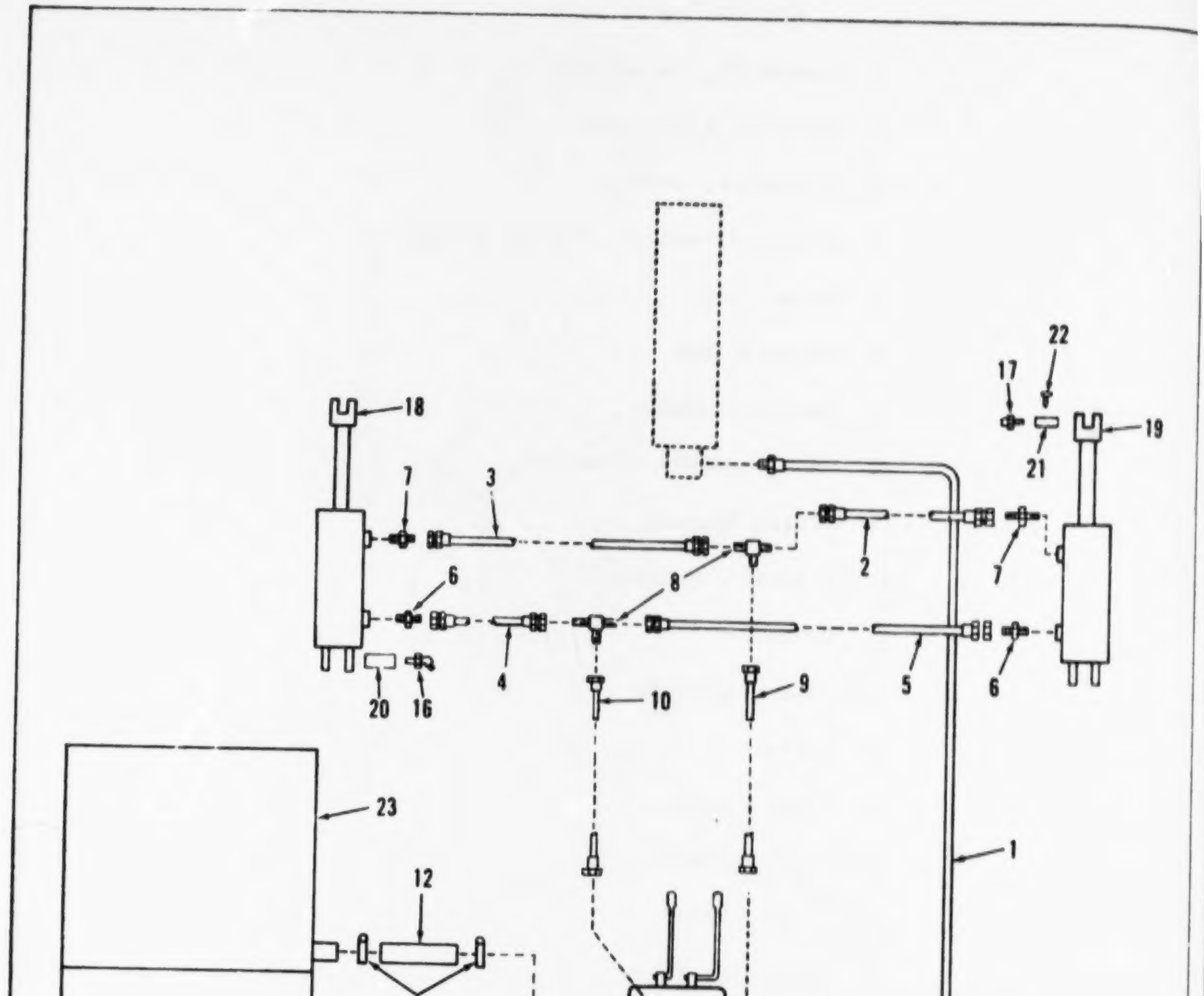
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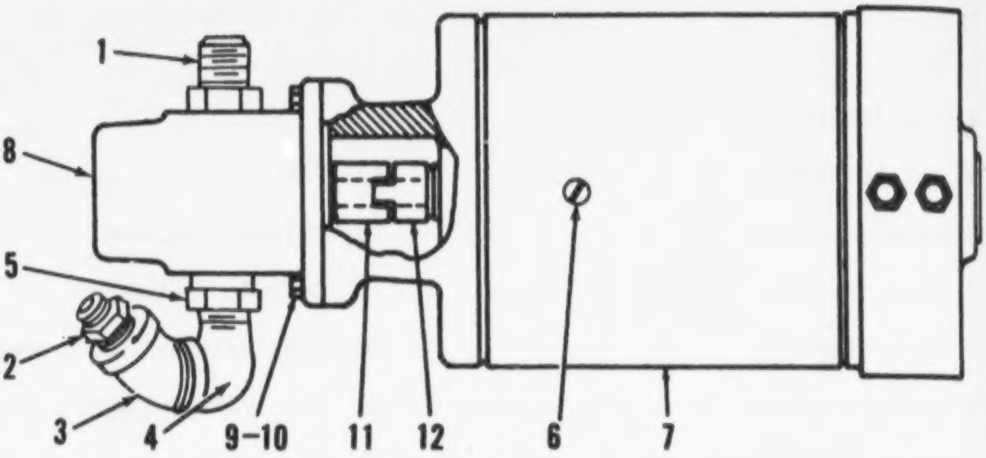
Figure 7-13. Hydraulic Assembly

Key to figure 7-13

1 Hose assembly
2 Hose assembly
3 Hose assembly
4 Hose assembly
5 Hose assembly
6 Adapter, straight
7 Adapter, straight
8 Tee, tube
9 Tube assembly
10 Tube assembly
11 Hose and tube assembly
12 Hose, rubber
13 Hose, rubber suction
14 Clamp, hose
15 Motor and pump arrangement
16 Fitting, lubrication
17 Fitting, lubrication
18 Cylinder assembly
19 Cylinder assembly
20 Pin, tilt cylinder, rear
21 Pin, tilt cylinder, front
22 Screw, lock,
23 Reservoir assembly hydraulic
24 Hydraulic controls
25 Tube assembly, metal
26 Tube assembly, metal
27 Tube assembly, metal
28 Elbow, wheel cylinders
29 Tee, strap, brake,



Key to figure 7-14

1	Adapter, straight
2	Adapter, straight
3	Elbow, pipe, street, 90 deg.
4	Elbow, pipe, street, 45 deg.
5	Adapter, straight
6	Screw, machine
7	Motor, dc hydraulic pump
8	Pump, rotary
9	Nut, plain, hex
10	Washer, lock
11	Coupling half, shaft
12	Coupling half, shaft

Figure 7-14. Motor and pump arrangement

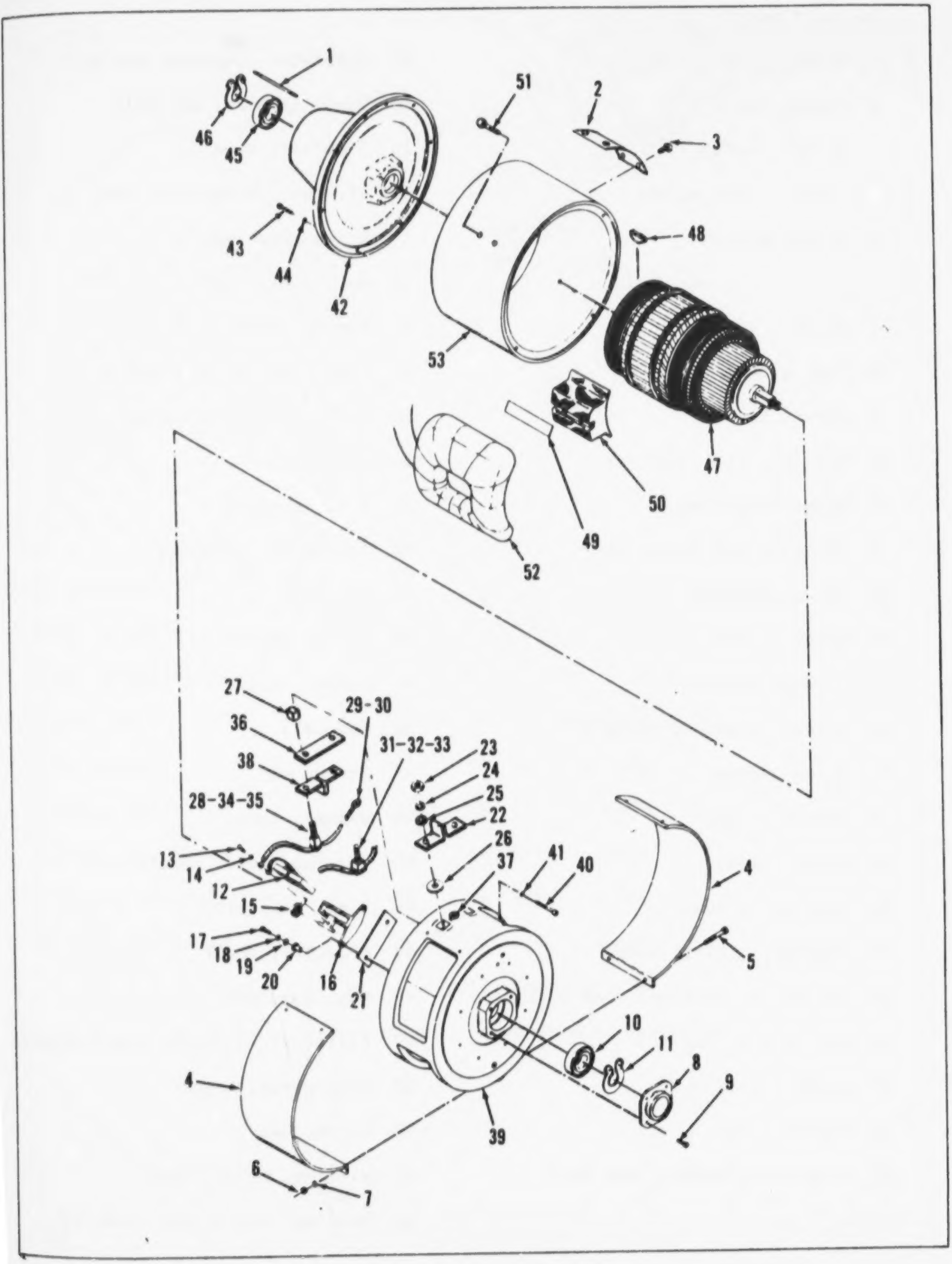

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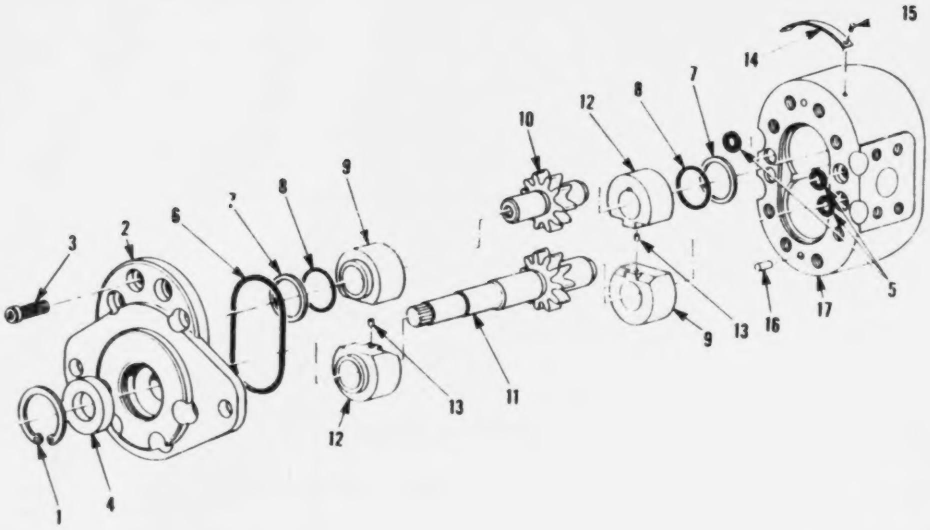
Figure 7-15. Motor, DC, Hydraulic Pump

Key to figure 7-15

1 Stud, plain
2 Plate, ident
3 Screw, drive
4 Cover, brush access
5 Screw, machine
6 Nut, plain, hex
7 Washer, lock
8 Cap, grease
9 Screw, machine
10 Bearing, ball, annular
11 Ring, retaining
12 Brush, electric contact
13 Screw, machine
14 Washer, lock
15 Spring, helical
16 Holder, electric contact
17 Screw, machine
18 Washer, lock
19 Washer, flat
20 Insulator, bushing
21 Insulator, plate holder
22 Insulator, external, end bell
23 Nut, plain, hex
24 Washer, lock
25 Washer, flat
26 Insulator, washer, end bell
27 Insulator, bushing, end bell
28 Stud, terminal end bell
29 Terminal, stud
30 Terminal, electrical lead
31 Screw, machine
32 Nut, plain, hex
33 Washer, lock
34 Lead, electrical brush
35 Lead, electrical brush
36 Insulator
37 Pin, straight
38 Insulator, external
39 End bell
40 Screw, cap
41 Washer, lock
42 End bell
43 Screw, cap
44 Washer, lock
45 Bearing, ball, annular
46 Ring, retaining
47 Armature, motor
48 Key, woodruff
49 Filler strip, motor field winding
50 Pole piece, magnet
51 Screw, cap
52 Winding, motor field
53 Housing, electrical rotating



Key to figure 7-16

1	Ring, retaining, seal
2	Cover, mounting flange
3	Screw, cap
4	Seal, plain
5	Packing, preformed
6	Packing, preformed
7	Retainer, packing
8	Packing, preformed
9	Bushing, pump
10	Gearshaft, spur
11	Gearshaft, spur
12	Bushing, pump
13	Pin, straight
14	Plate, ident
15	Screw, drive
16	Pin, straight
17	Housing, pump

Figure 7-16. Pump, rotary, power driven, hydraulic

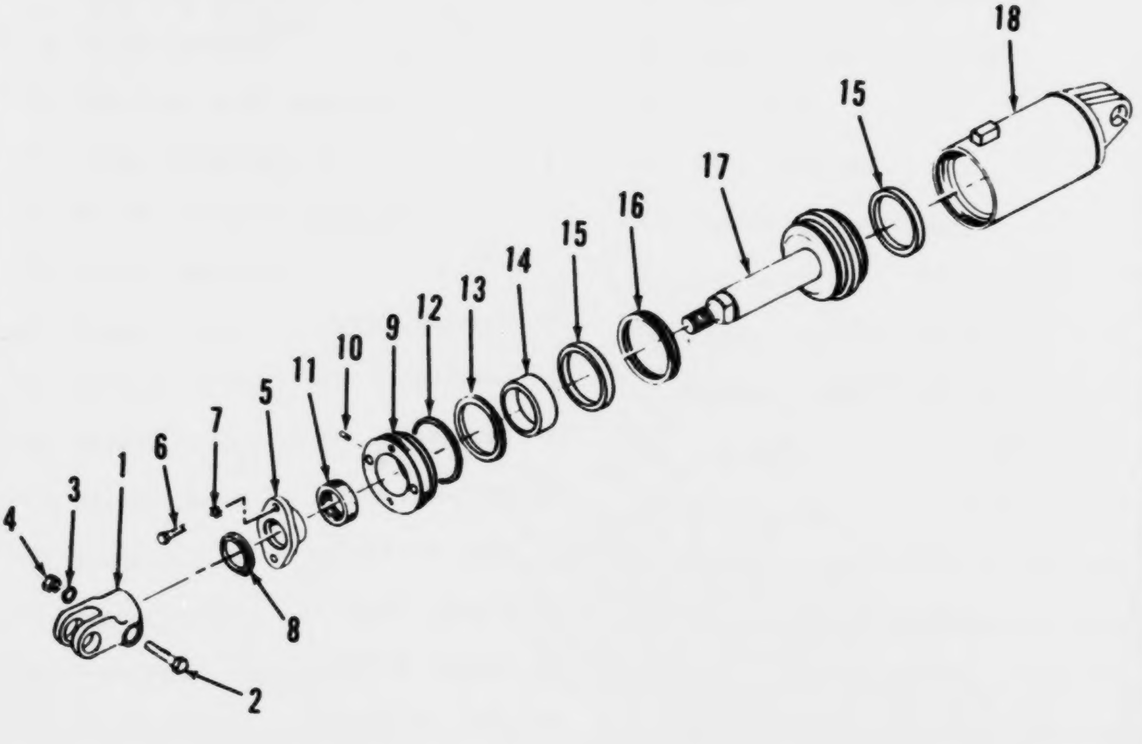

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Figure 7-17. Cylinder Assembly, Actuating, Linear, Tilt

Key to figure 7-17

1 Clevis, rod end

2 Screw, cap

3 Washer, lock

4 Nut, plain, hex

5 Retainer, packing

6 Screw, cap

7 Washer, lock

8 Ring, wiper

9 Stuffing box, tilt cylinder

10 Plug, lock

11 Packing set

12 Packing, preformed

13 Ring, back-up

14 Spacer, piston

15 Ring, U, Piston

16 Ring, T, piston

17 Piston assy

18 Cylinder tube

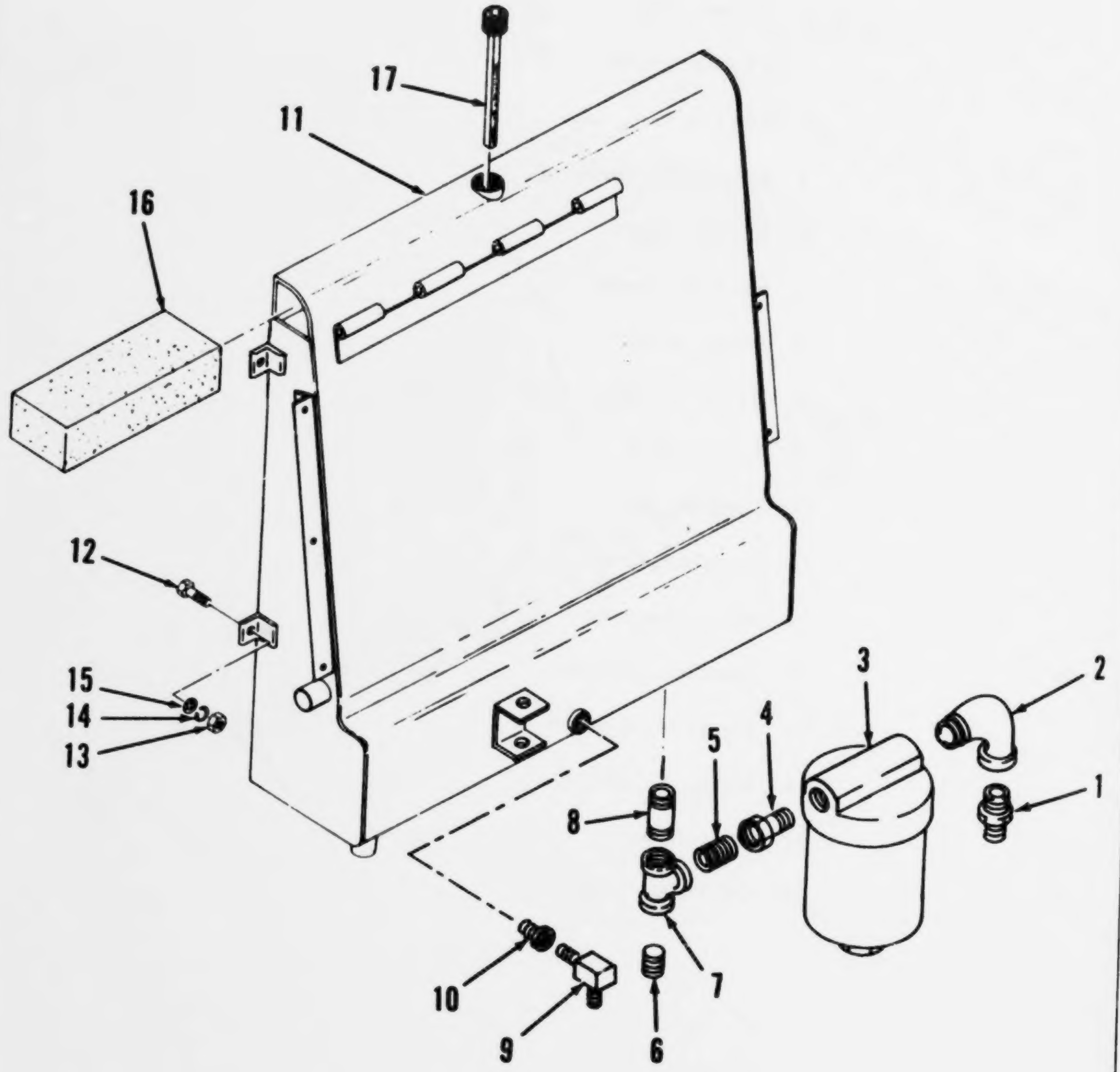
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Figure 7-18. Reservoir Assembly, Hydraulic

Key to figure 7-18

1 Adapter, straight

2 Elbow, pipe, street

3 Filter, fluid, pressure

4 Bushing

5 Nipple, pipe

6 Plug, pipe

7 Tee, pipe

8 Nipple, pipe

9 Elbow, pipe

10 Bushing, pipe reservoir

11 Reservoir, hydraulic oil

12 Screw, cap

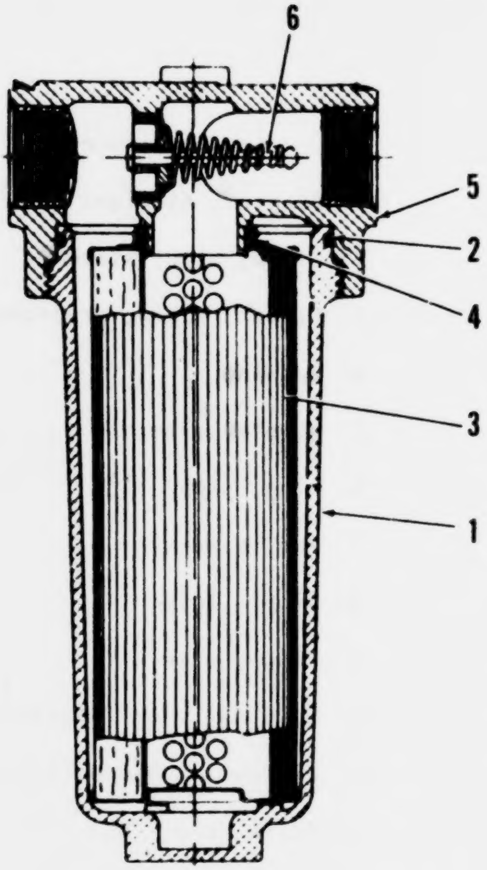
13 Nut, plain, hex

14 Washer, lock

15 Washer, flat

16 Filter, hydraulic reservoir

17 Dipstick, hydraulic reservoir



Key to figure 7-19

1 Housing, filter element

2 Packing, preform

3 Filter, element

4 Packing, preform

5 Head, filter

6 Valve, by-pass

Figure 7-19. Filter, fluid, pressure, pump intake

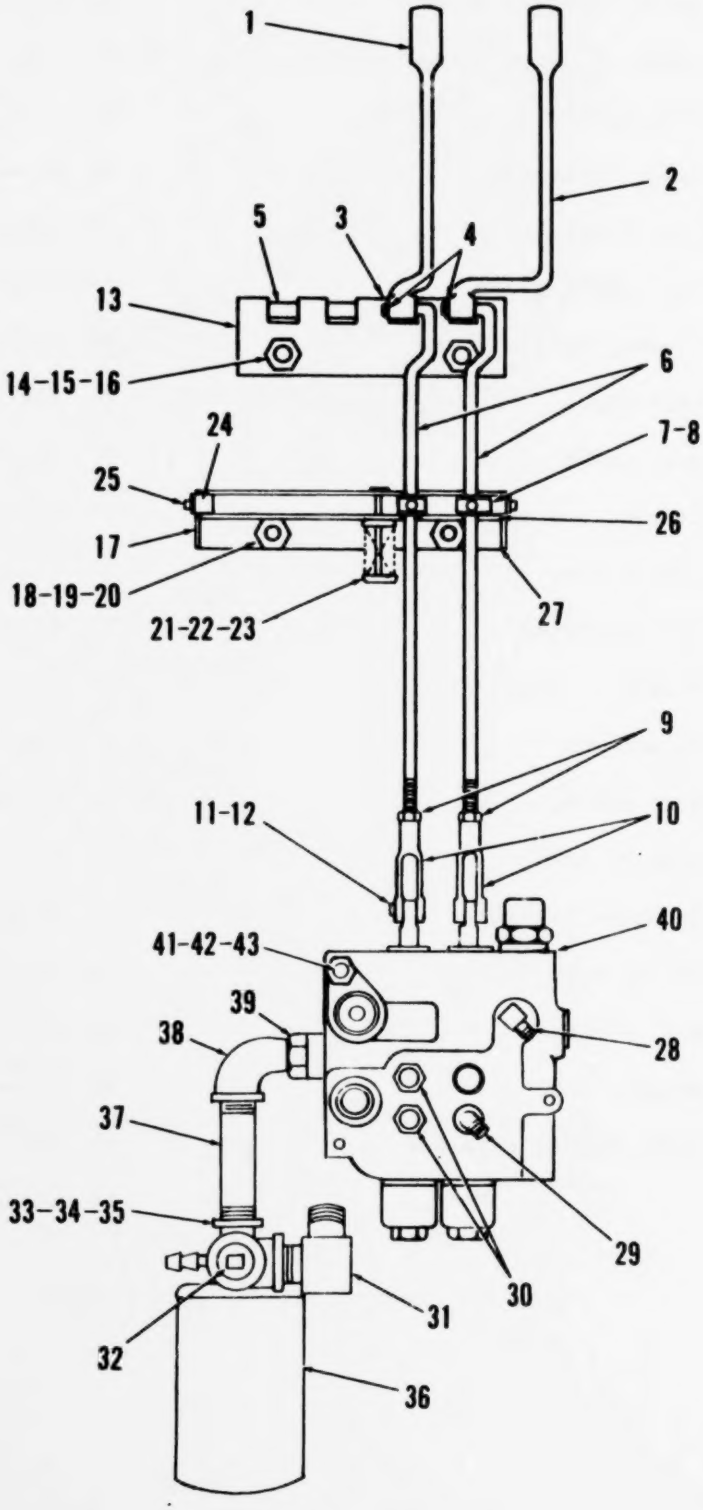

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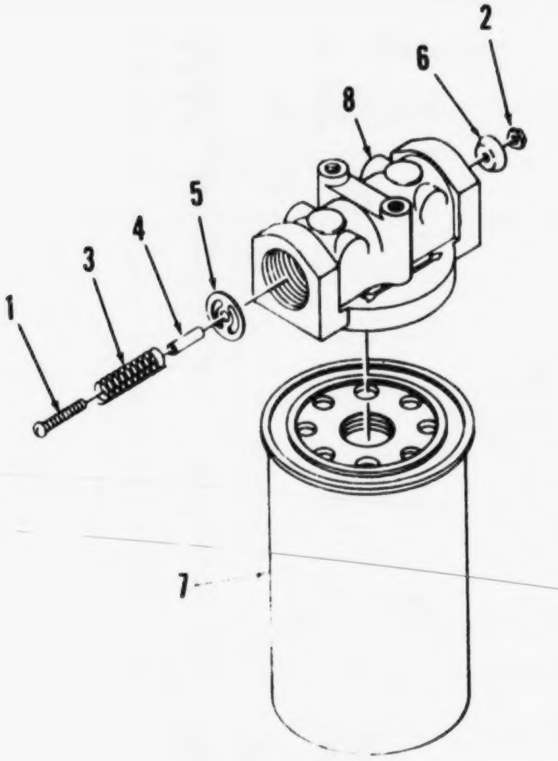
Figure 7-20. Hydraulic Controls

Key to figure 7-20

1	Lever, control valve
2	Lever, control valve
3	Pin, cotter
4	Ring, retaining
5	Pin, straight
6	Rod, connecting
7	Sleeve, control valve
8	Setscrew
9	Nut, plain
10	Clevis, rod end
11	Pin, cotter
12	Pin, straight
13	Bracket, lever
14	Screw, cap
15	Nut, plain
16	Washer, lock
17	Actuator assembly
18	Screw, cap
19	Nut, plain
20	Washer, lock
21	Disk, spring retainer
22	Spring, helical
23	Pin, spring retainer
24	Clip, spacer
25	Screw, self-tapping
26	Hinge
27	Bracket
28	Elbow
29	Elbow
30	Adapter
31	Elbow, pipe
32	Plug, pipe
33	Elbow
34	Bushing
35	Tee, pipe
36	Filter, fluid
37	Nipple
38	Elbow, pipe street
39	Adapter
40	Control valve assembly
41	Screw, cap
42	Nut, plain
43	Washer, lock



Key to figure 7-21

1 Screw, machine valve
2 Nut, self-locking hexagon
3 Spring, helical
4 Spacer
5 Guide
6 Valve, by-pass
7 Filter element
8 Head, filter

Figure 7-21. Filter, fluid, pressure

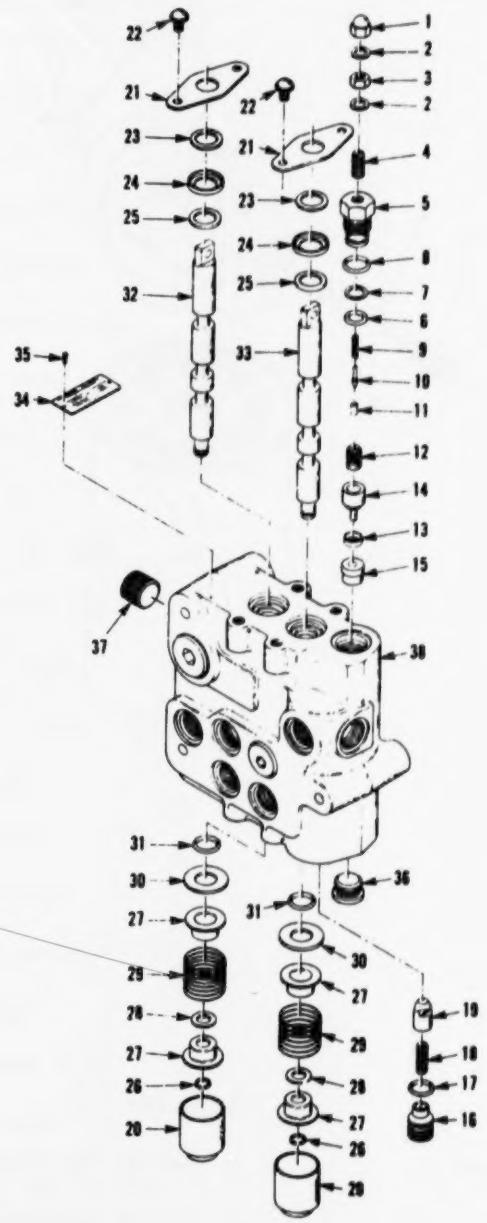

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Figure 7-22. Control Valve Assembly

Key to figure 7-22

1 Nut, acorn
2 Packing, preform
3 Nut, plain
4 Setscrew
5 Cap, relief valve
6 Packing, preform
7 Ring, backup
8 Packing, preform
9 Spring, helical
10 Plunger, pilot
11 Seat, pilot
12 Spring helical
13 Screen, plunger
14 Plunger, poppet
15 Seat, poppet
16 Cap, check valve
17 Packing, preform
18 Spring, helical
19 Poppet, check valve
20 Cap, spool
21 Plate, retainer
22 Screw, assembled washer
23 Ring, wiper spool
24 Retainer, spool
25 Packing, preform
26 Ring, retaining
27 Spacer, spool
28 Washer, flat
29 Spring, helical
30 Retainer, preformed packing
31 Packing, preform
32 Spool, hydraulic control
33 Spool, hydraulic control
34 Plate, identification
35 Screw, drive
36 Plug, pipe
37 Plug, pipe
38 Body

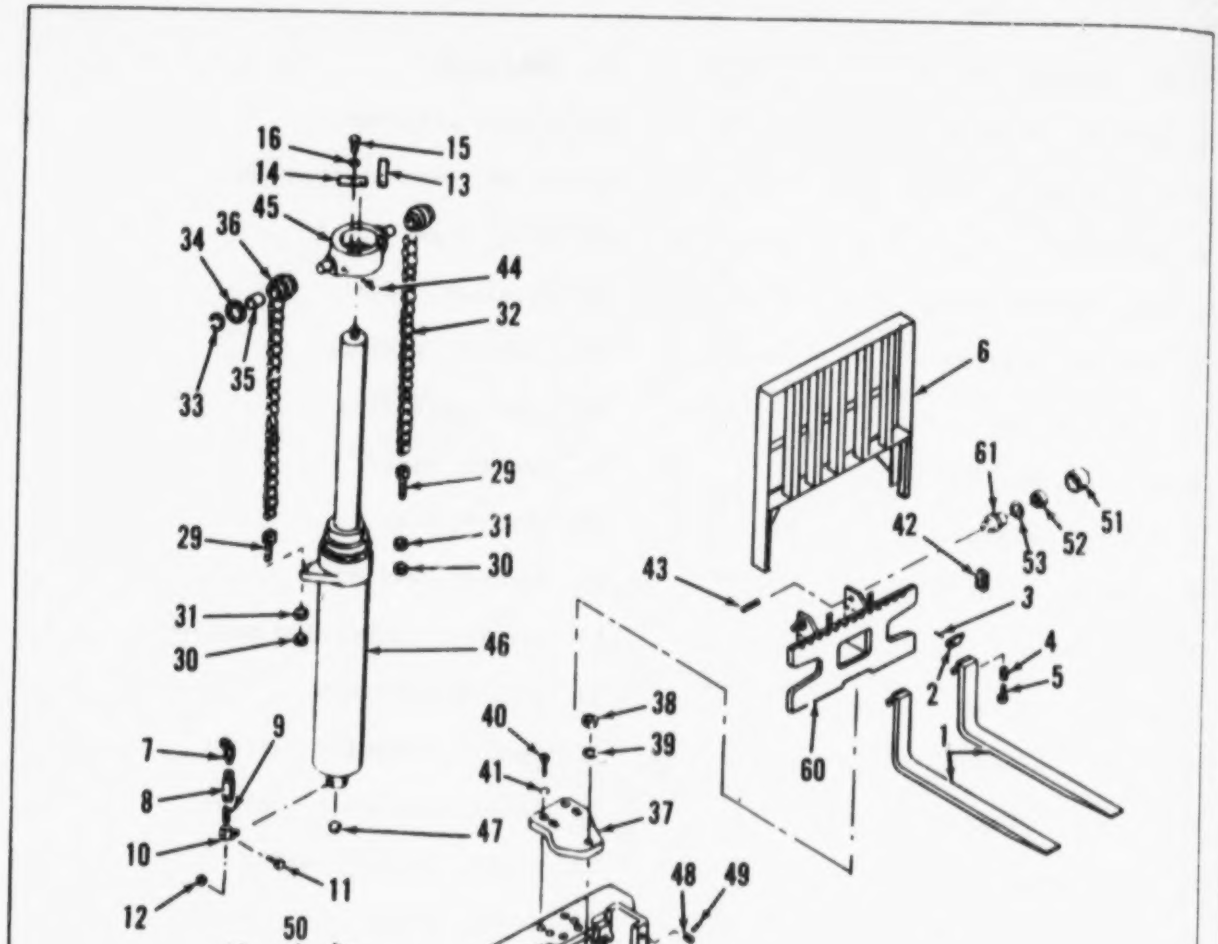
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Figure 7-23. Uprights, Backrest, Fork and Carriage Assembly

Key to figure 7-23

1 Fork, lift truck
2 Handle, fork pin retainer
3 Pin, spring handle
4 Spring, helical
5 Pin, fork retaining
6 Backrest, load
7 Elbow
8 Regulator, flow
9 Nipple, pipe
10 Elbow, pipe
11 Screw, cap
12 Nut, self-locking
13 Bar, chain retainer
14 Bar, chain retainer
15 Screw, cap,
16 Washer, lock
17 Fitting, lubrication
18 Lever, upright
19 Pin, cotter
20 Washer, flat
21 Pin, cotter
22 Washer, flat
23 Pin, spring
24 Shaft
25 Spring, helical
26 Lever, upright
27 Setscrew
28 Nut, plain
29 Screw, adjusting chain
30 Nut, plain

Key to figure 7-23 (cont)

31 Nut, plain
32 Chain, rollers
33 Ring, retaining
34 Washer, flat
35 Bearing, sleeve roller
36 Roller, crosshead
37 Brace, hoist cylinder
38 Nut, self-locking
39 Washer, flat
40 screw, cap
41 Washer, lock
42 Block, striker carriage
43 Setscrew
44 Fitting, lubrication
45 Crosshead, hoist cylinder
46 Hoist cylinder,assembly
47 Ball, bearing
48 Plug, lock
49 Setscrew
50 Setscrew
51 Roller, carriage
52 Bearing, ball
53 Shim, carriage roller
54 Fitting, lubrication
55 Bearing half
56 Pin, straight
57 Insert, bronze
58 Upright, inner
59 Upright, outer
60 Carriage, upright
61 Trunnion, carriage

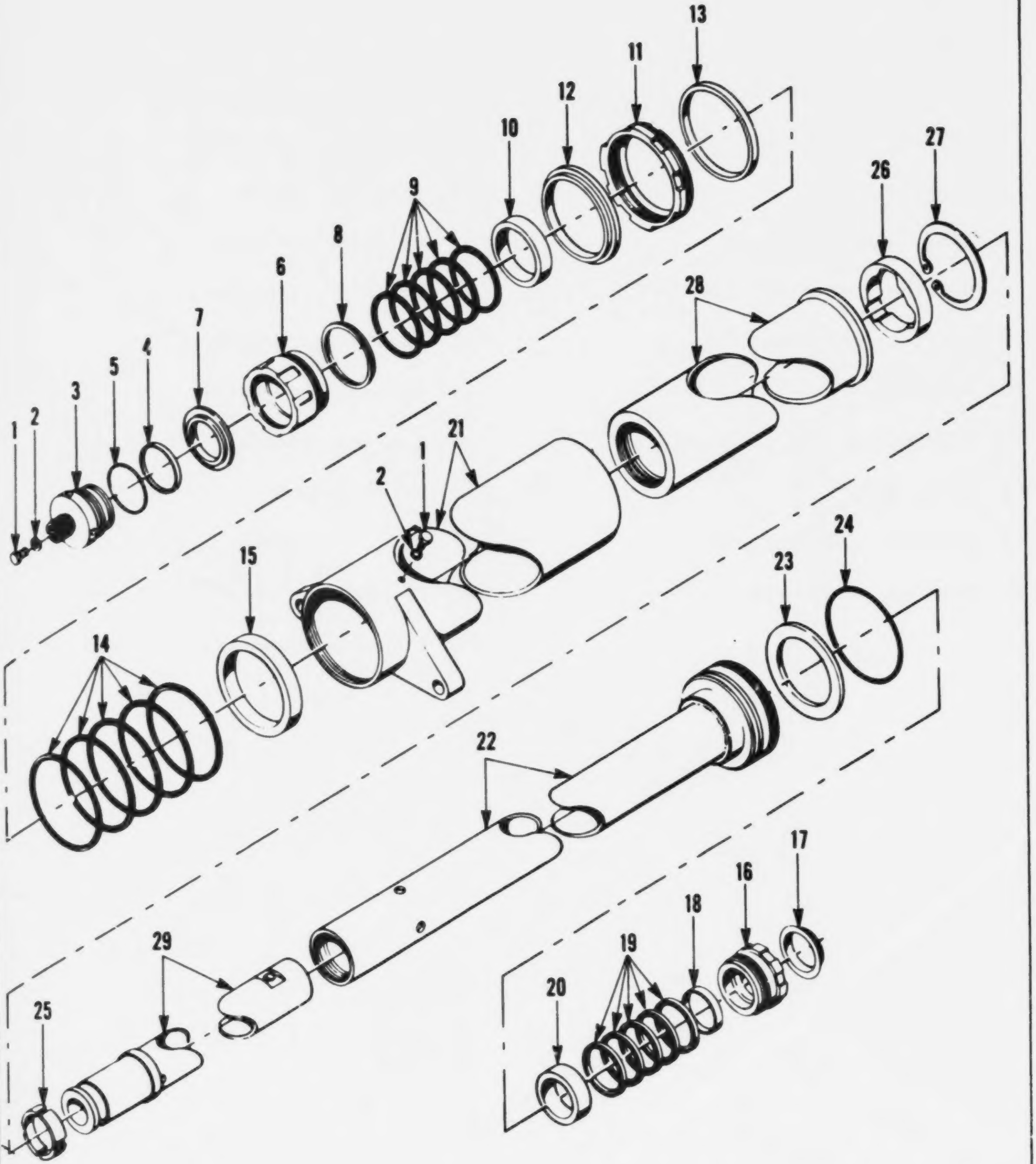
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Figure 7-24. Hoist Cylinder Assembly, Actuating, Linear

Key to figure 7-24

1 Screw, cap
2 Washer, nonmetallic
3 End, cylinder
4 Washer, nonmetallic
5 Packing, preformed
6 Packing nut
7 Ring, wiper
8 Retainer, packing, nut
9 Packing, preformed
10 Bearing, sleeve
11 Packing nut
12 Ring, wiper
13 Retainer, packing, nut
14 Packing, preformed
15 Bearing, sleeve
16 Packing nut
17 Ring, wiper
18 Retainer, packing
19 Packing, preformed
20 Bearing, sleeve
21 Cylinder, primary
22 Cylinder, secondary
23 Packing, preformed
24 Washer, nonmetallic
25 Bearing, sleeve
26 Guide, plunger
27 Ring, retaining
28 Plunger, primary
29 Plunger, secondary

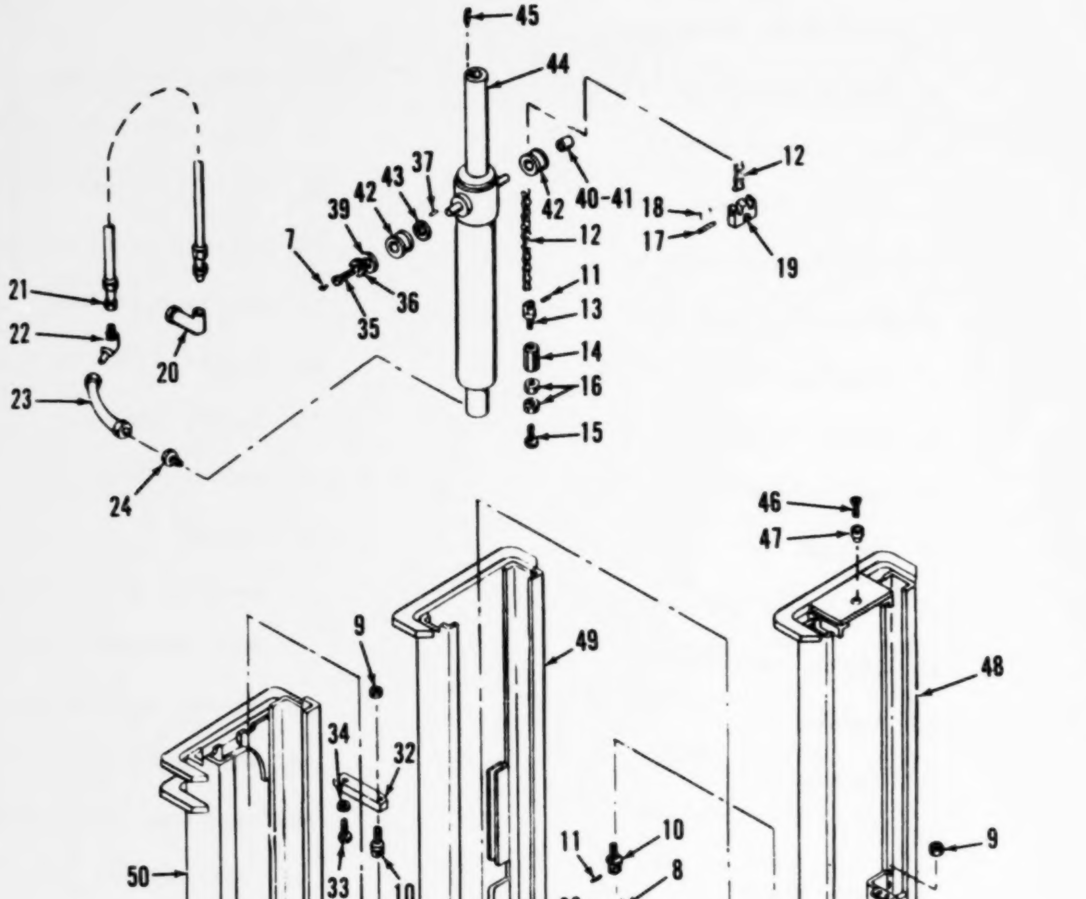
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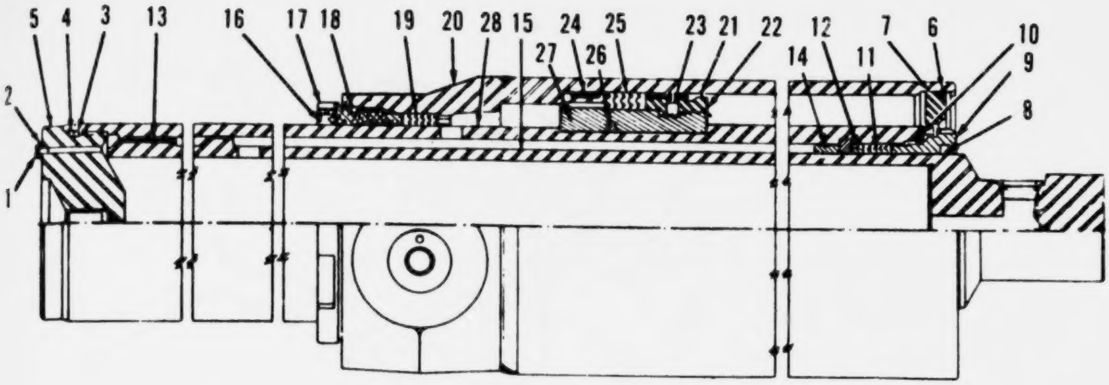
Figure 7-25. Uprights, Backrest, Fork and Carriage Assembly

Key to figure 7-25

1	Fork, lift truck
2	Handle, fork pin retainer
3	Pin, spring handle
4	Spring, helical
5	Pin, fork retaining
6	Backrest, load
7	Fitting, lube rollers
8	Chain, mast
9	Nut, plain
10	Anchor
11	Pin, mast and carriage
12	Chain, carriage
13	Anchor
14	Turnbuckle
15	Bolt
16	Nut, plain
17	Pin, connection
18	Pin, cotter
19	Anchor
20	End fitting, truck
21	Hose assembly
22	Elbow
23	Tube assembly
24	Adapter, cylinder base
25	Nut, lock
26	Screw
27	Ring, retaining
28	Plug, carriage roller
29	Stud, carriage roller
30	Roller, carriage roller
31	Carriage assembly
32	Anchor plate
33	Screw, cap
34	Washer, lock
35	Screw
36	Washer, lock
37	Pin, straight
38	Screw, special
39	Washer, flat
40	Bearing, inner race
41	Bearing
42	Roller, cylinder
43	Washer, flat
44	Cylinder assembly
45	Pin, straight
46	Screw, machine
47	Spacer
48	Channel, inner
49	Channel, center
50	Channel, outer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Key to figure 7-26

1 Screw, bleeder

2 Gasket

3 Packing, preform

4 Ring

5 Head, plunger

6 Ring, retaining

7 Stuffing box

8 Gland, packing

9 Ring, wiper

10 Packing, preform

11 Packing set

12 Ring, packing

13 Ring, wear

14 Spacer, rod

15 Rod, cylinder

16 Ring, wiper

17 Gland, packing

18 Packing, preform

19 Packing set

20 Cylinder, outer

21 Ring, wiper

22 Gland, packing

23 Setscrew

24 Ring, wear

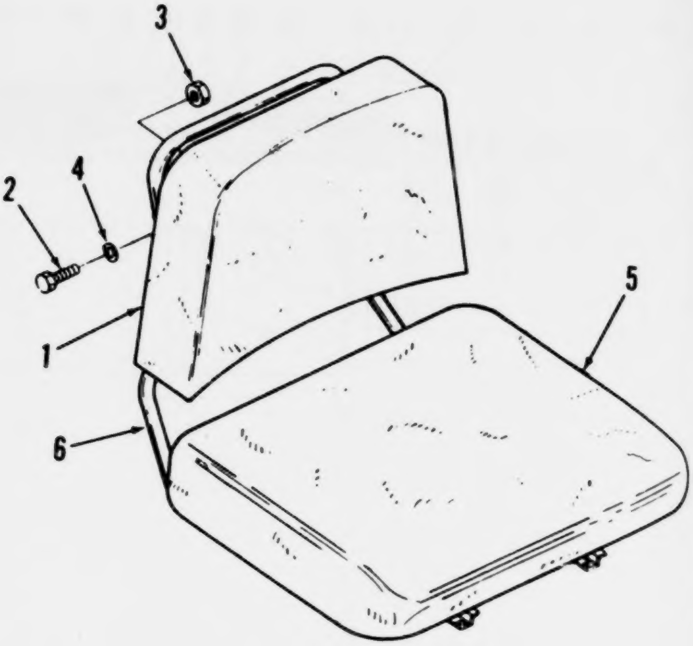
25 Packing set

26 Packing, preform

27 Piston, outer

28 Cylinder

Figure 7-26. Cylinder assembly



Key to figure 7-27

1 Cushion, backrest

2 Screw, machine

3 Nut, self-locking

4 Washer, flat

5 Cushion, seat

6 Frame, seat

Figure 7-27. Seat, individual

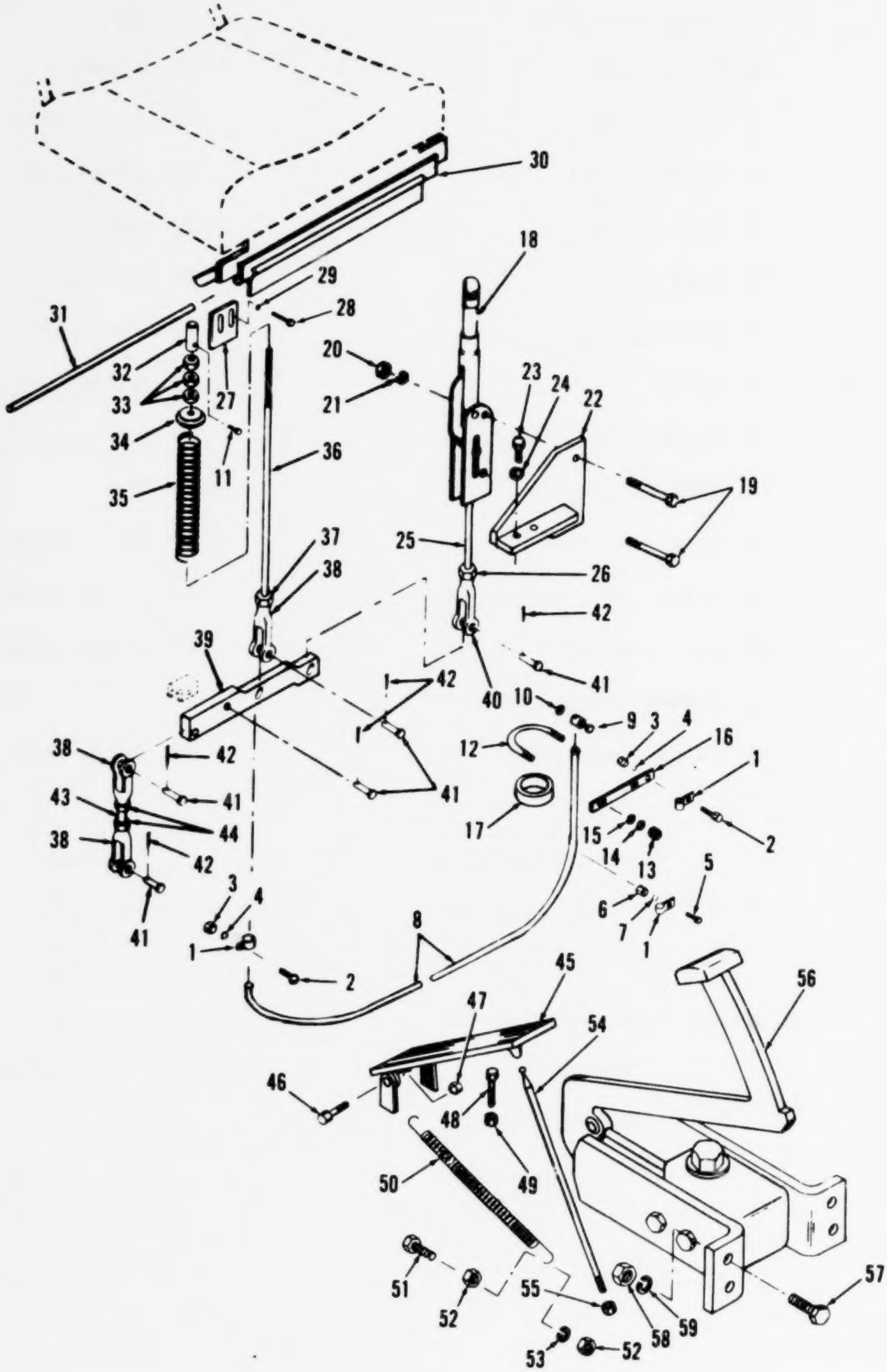

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Figure 7-28. Mechanical Controls Arrangement

Key to figure 7-28

1 Clip, retaining
2 Screw, cap
3 Nut, plain
4 Washer, lock
5 Screw, cap
6 Nut, plain
7 Washer, lock
8 Cable
9 Connector
10 Washer, flat
11 Screw, machine
12 Clamp
13 Nut, plain
14 Washer, lock
15 Washer, flat
16 Bar
17 Grommet
18 Brake lever
19 Screw, cap
20 Nut, plain
21 Washer, lock
22 Bracket
23 Screw, cap
24 Washer, lock
25 Rod
26 Nut, plain
27 Strip, switch support
28 Screw, cap
29 Washer, flat
30 Rail, seat guide

Key to figure 7-28 (cont)

31	Hinge pin
32	Cap
33	Nut, plain
34	Stop, rod
35	Spring, helical
36	Rod
37	Nut, plain
38	Clevis
39	Lever, brake
40	Clevis
41	Pin, straight
42	Pin, cotter
43	Rod, brake
44	Nut, plain
45	Pedal, accelerator
46	Screw, cap
47	Nut, self-locking
48	Screw, cap
49	Nut, plain
50	Spring, helical
51	Screw, cap
52	Nut, plain
53	Washer, lock
54	Rod
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56	Cylinder assy, master brake
57	Screw, cap
58	Nut, plain
59	Washer, lock

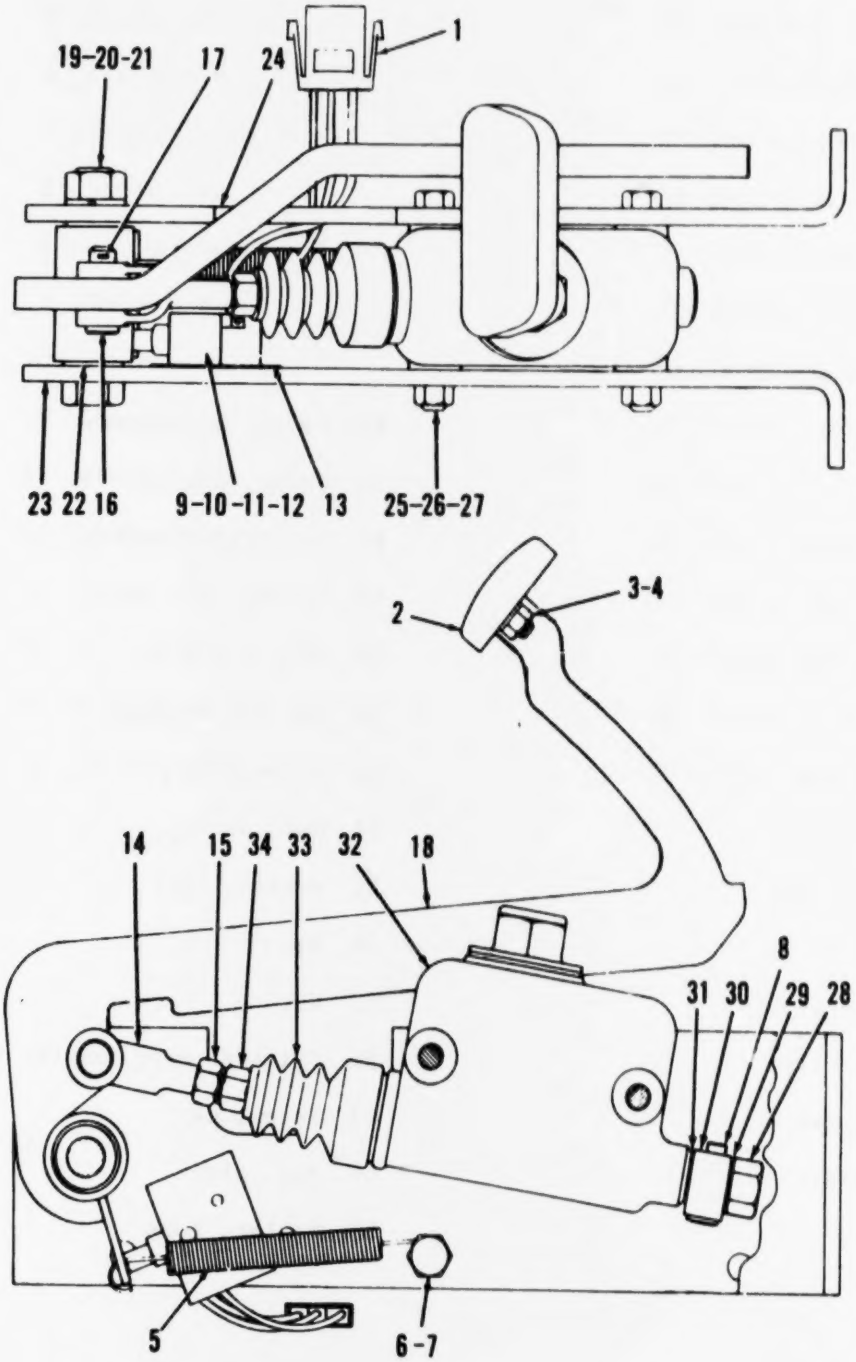
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Figure 7-29. Cylinder Assembly, Master Brake

Key to figure 7-29

1 Wiring harness
2 Pad, pedal
3 Nut, plain
4 Washer, lock
5 Spring, helical
6 Screw, cap
7 Nut, plain
8 Plug, pipe
9 Switch, push
10 Screw, machine
11 Nut, plain
12 Washer, lock
13 Insulator
14 Yoke end
15 Nut, plain
16 Pin, straight
17 Pin, cotter
18 Lever
19 Screw, cap
20 Nut, plain
21 Washer, lock
22 Bushing, sleeve
23 Bracket
24 Bracket
25 Screw, cap
26 Nut, plain
27 Washer, lock
28 Bolt, connector
29 Gasket
30 Fitting, tube
31 Gasket, tube
32 Cylinder assembly
33 Boot
34 Rod, push

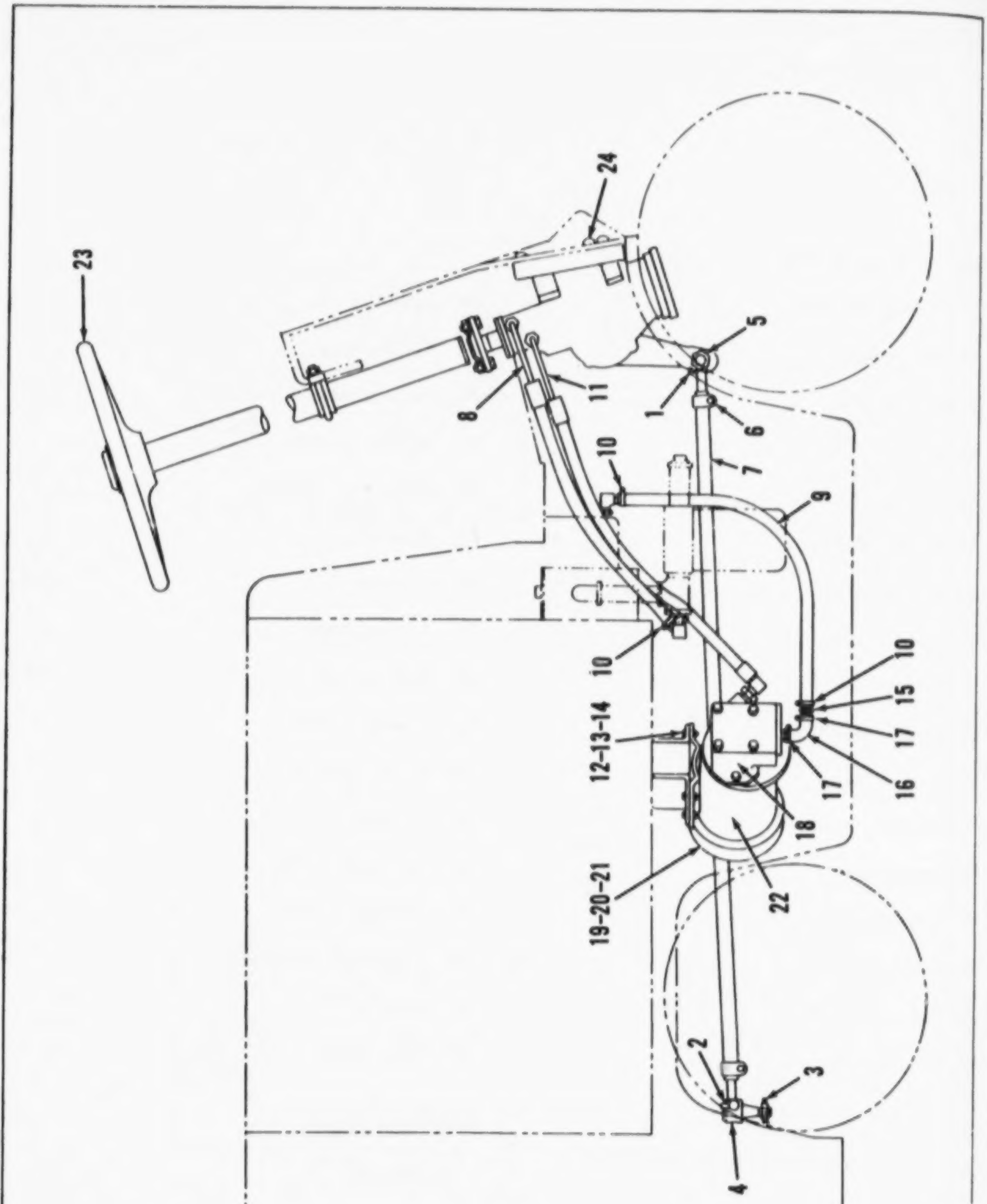

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Figure 7-30. Steering Control System

Key to figure 7-30

1 Fitting, lubrication
2 Fitting, lubrication
3 Pin, cotter
4 Tie rod end
5 Tie rod end
6 Clamp
7 Draglink, steering
8 Hose assembly
9 Hose, rubber
10 Clamp, hose
11 Hose assembly
12 Screw, cap
13 Nut, plain
14 Washer, lock
15 Adapter, hose
16 Elbow, hose
17 Clamp, hose
18 Pump, hydraulic
19 Cover, fan
20 Bracket, cover
21 Fan, electrical
22 Motor, direct current
23 Steering unit
24 Screw, cap

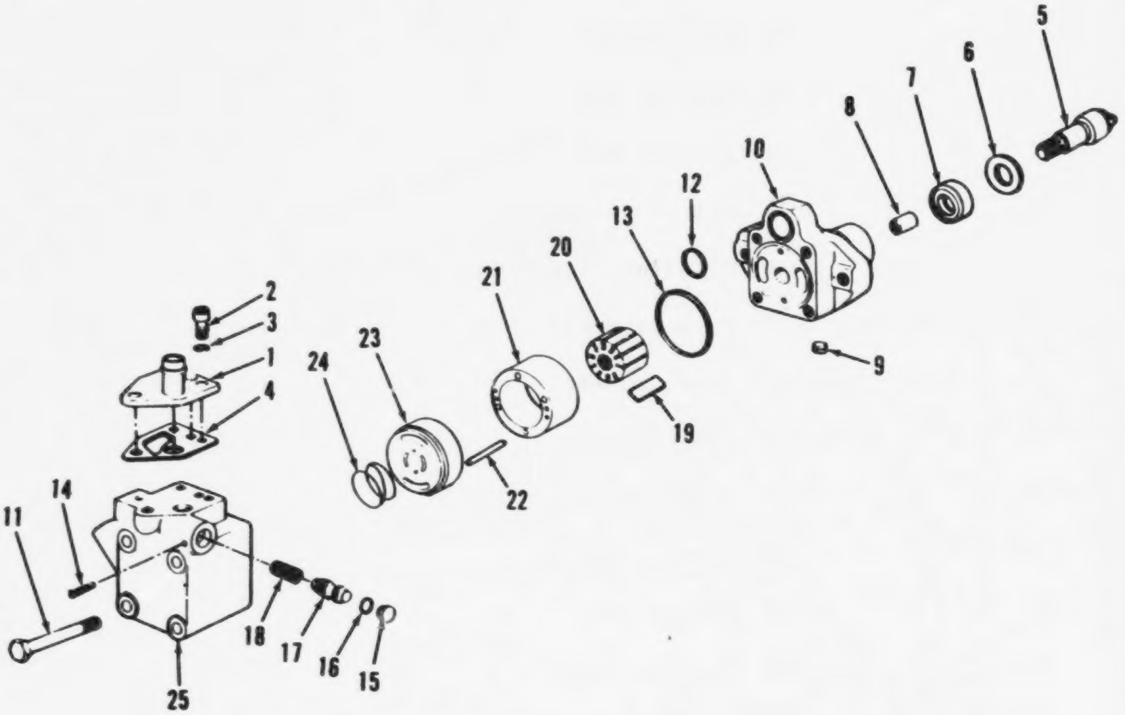
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Figure 7-31. Pump, Hydraulic, Power Steering

Key to figure 7-31

1	Manifold, pump
2	Screw, cap
3	Washer, flat
4	Gasket, manifold
5	Shaft, pump
6	Washer, flat
7	Seal, shaft
8	Bearing, sleeve shaft
9	Plug, body
10	Body, pump
11	Screw, cap
12	Packing, preform
13	Packing, preform
14	Pin, control valve retaining
15	Plug, control valve
16	Packing, preform
17	Control valve
18	Spring, helical
19	Vane kit, pump
20	Rotor, pump
21	Ring, pump
22	Pin, straight
23	Pressure plate
24	Spring, helical
25	Cover, pump

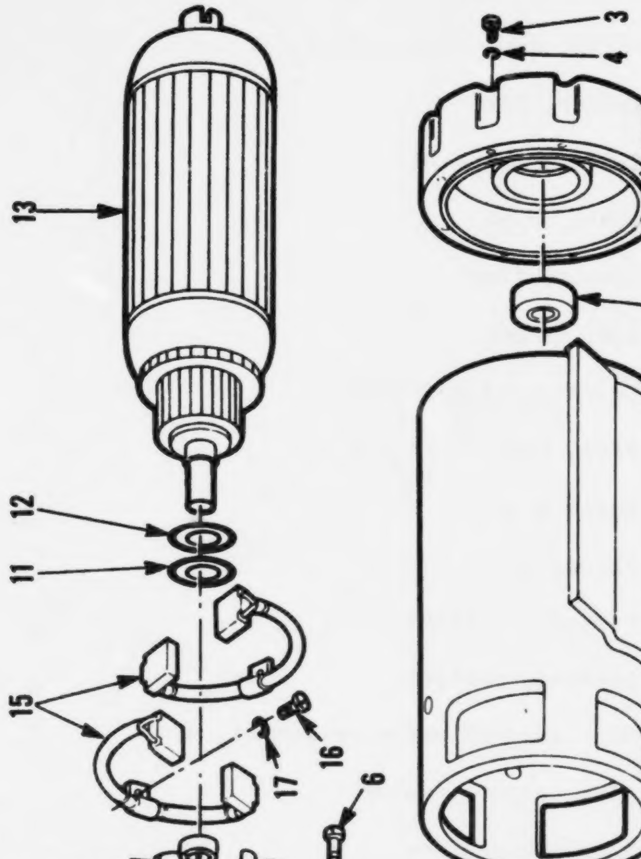
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Figure 7-32. Motor, Direct Current

Key to figure 7-32

1	End bell
2	End bell assembly
3	Screw, machine
4	Washer, lock
5	Holder, electric
6	Screw, cap
7	Washer, lock
8	Spring, spiral
9	Bearing, ball
10	Bearing, ball
11	Washer, thrust
12	Washer, thrust
13	Armature, motor
14	Field and frame assembly
15	Brush set, electric contact
16	Screw, machine
17	Washer, lock
18	Nut, plain
19	Washer, lock
20	Washer, flat
21	Winding, motor
22	Winding, motor
23	Winding, motor
24	Winding, motor

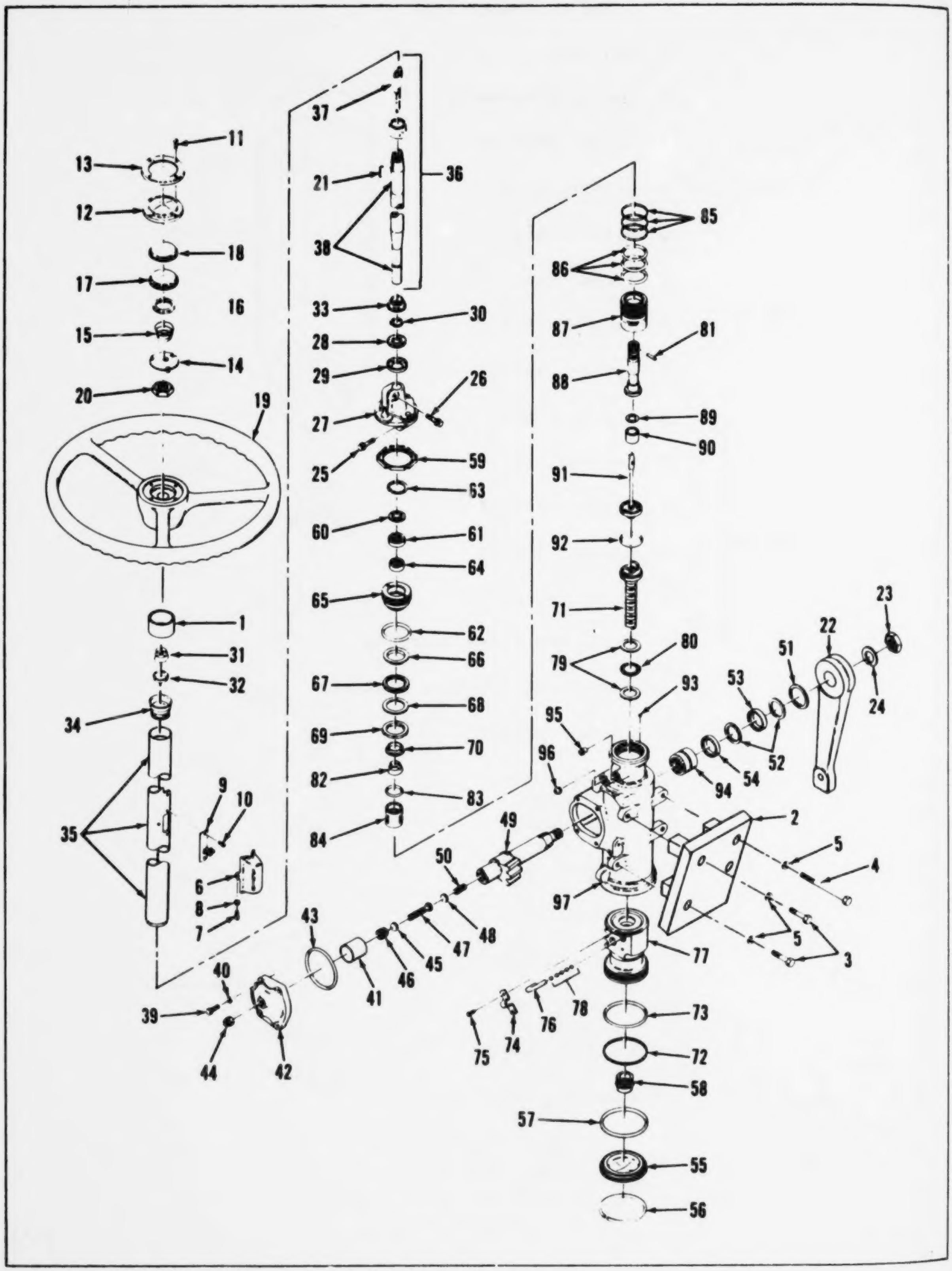
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Figure 7-33. Steering Unit

Key to figure 7-33

1 Grommet
2 Plate, mounting
3 Screw, cap
4 Screw, cap
5 Washer, lock
6 Cover, connector
7 Screw, machine
8 Washer, lock
9 Connector, horn
10 Screw, tapping
11 Screw, machine
12 Button, horn
13 Cover, button
14 Contact, horn
15 Spring, helical
16 Insulator, horn
7 Contact, base, plate
8 Separator, horn
9 Steering wheel
0 Nut, plain, hex
1 Key, woodruff
2 Arm, steering
3 Nut, plain
Washer, lock
Bolt, shoulder

26 Bolt, shoulder
27 Reinforcement, coupling
28 Seal, dust
29 Retainer, lower
30 Ring, retaining
31 Spring, helical
32 Seat, spring
33 Bearing assembly
34 Bearing assembly
35 Jacket and adapter
36 Shaft assembly
37 Contact assembly
38 Shaft, steering
39 Screw, cap
40 Washer, lock
41 Bearing, sleeve
42 Cover, housing side
43 Packing, preform
44 Nut, plain
45 Washer, thrust
46 Retainer, lash
47 Adjuster, lash
48 Washer, thrust
49 Gearshaft
50 Spring, helical

Key to figure 7-33 (cont)

51 Ring, retaining
52 Washer, backup
53 Seal, plain
54 Seal, plain
55 Plug, housing
56 Ring, retaining
57 Packing, preform
58 Plug, rack
59 Nut
60 Seal, plain
61 Seal, plain
62 Packing, preform
63 Ring, retaining
64 Bearing, roller
65 Plug, adjuster
66 Race, upper
67 Bearing, roller
68 Race, upper
69 Spacer, thrust
70 Retainer, spacer
71 Worm assembly
72 Ring, piston
73 Packing, preform
74 Clamp, ball
75 Screw, assembled
76 Guide, ball
77 Ball nut
78 Ball seat, recirculating
79 Race, lower
80 Bearing, roller
81 Pin, torsion bar
82 Spring, helical
83 Packing, preform
84 Spool, valve
85 Ring, valve
86 Packing, preform
87 Body, valve
88 Shaft assembly
89 Packing, preform
90 Sleeve, torsion bar
91 Cap and torsion bar
92 Packing, preform
93 Ball, bearing
94 Bearing, roller
95 Connector, housing
96 Connector, housing
97 Housing, steering

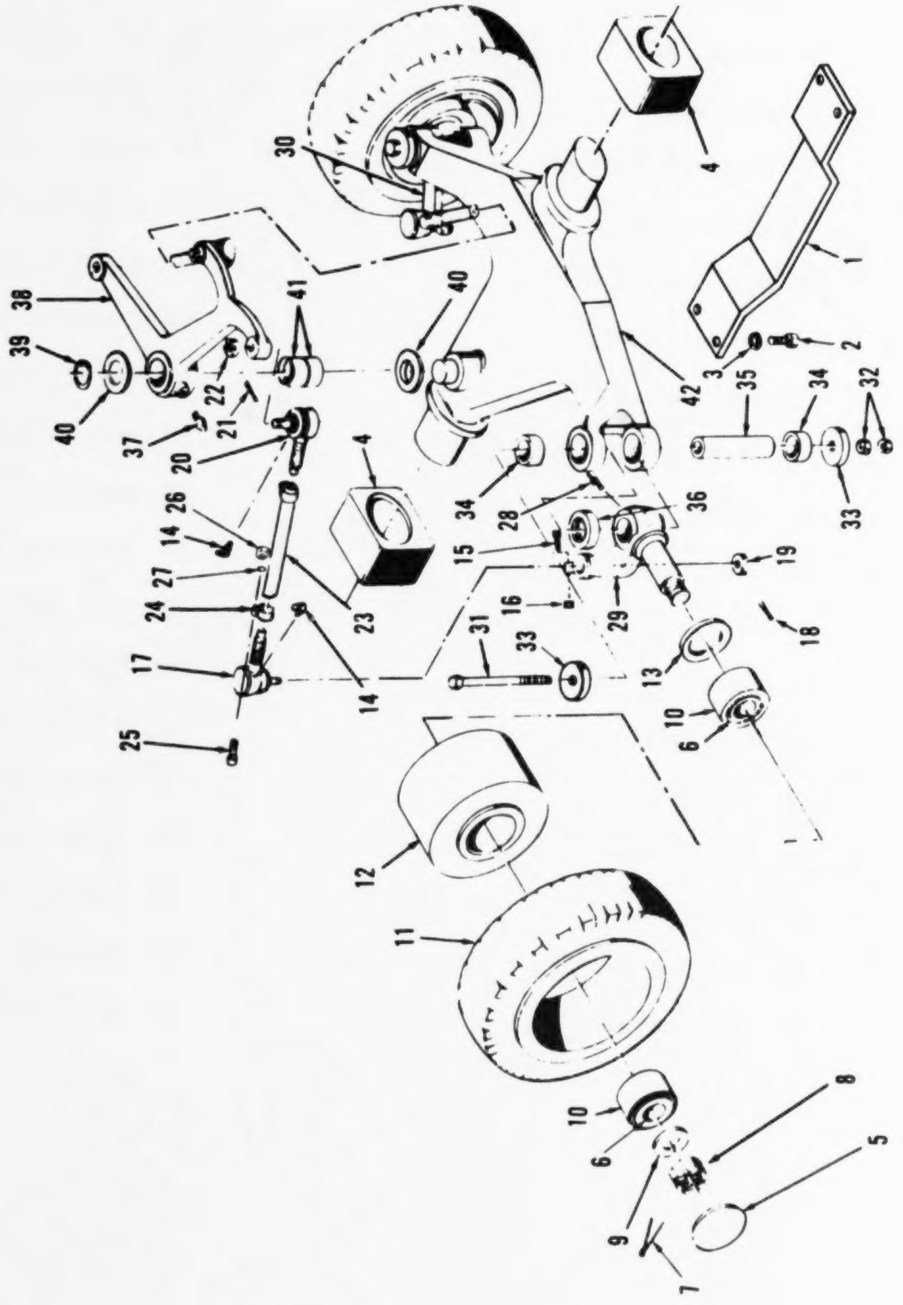

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Figure 7-34. Steering Axle Arrangement

Key to figure 7-34

1 Plate, axle retaining
2 Screw, cap
3 Washer, lock
4 Block, axle
5 Cap, grease
6 Cone and rollers
7 Pin, cotter
8 Nut, castellated
9 Washer, flat
10 Cup, tapered
11 Tire, solid rubber
12 Wheel
13 Seal, plain
14 Fitting, lubrication
15 Bolt
16 Nut, plain
17 Tie rod end
18 Pin, cotter
19 Nut, slotted
20 Tie rod end
21 Pin, cotter
22 Nut, slotted
23 Rod, aligning
24 Clamp
25 Bolt, machine
26 Nut, plain
27 Washer, lock
28 Fitting, lubrication
29 Knuckle, steer
30 Knuckle, steer
31 Screw, cap
32 Nut, plain
33 Washer, flat
34 Bearing, roller
35 Pin, hollow
36 Bearing, roller
37 Fitting, lubrication
38 Lever, bellcrank
39 Ring, retaining
40 Washer, flat
41 Bearing, roller
42 Axle, vehicular

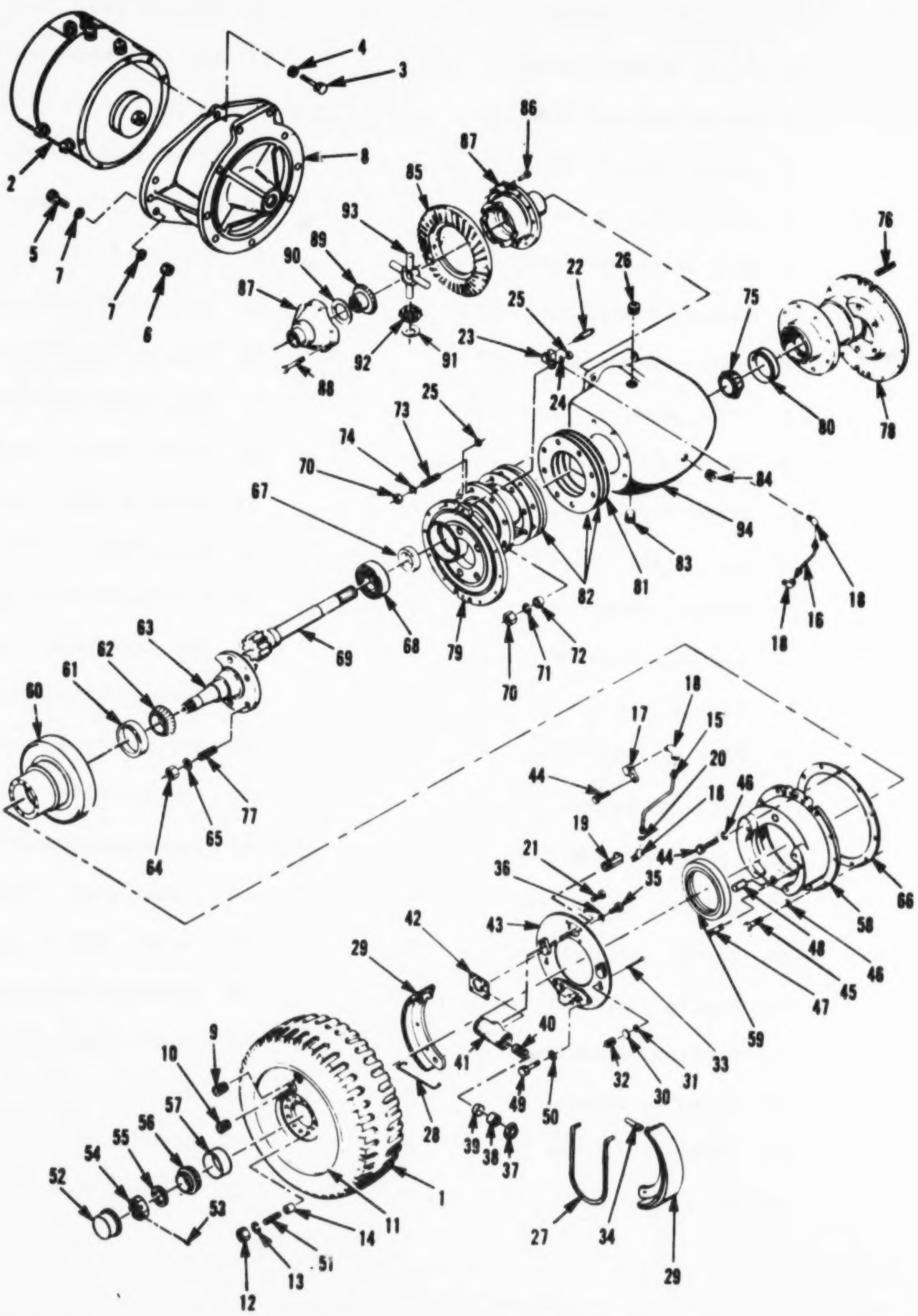
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Figure 7-35. Drive Axle, Adapter, Drive Motor and Tire

Key to figure 7-35

1 Tire, solid rubber
2 Motor, direct current
3 Screw, cap
4 Washer, lock
5 Screw, cap
6 Nut, self-locking
7 Washer, flat
8 Adapter arrangement
9 Plug, pipe
10 Plug, pipe
11 Brake drum
12 Nut, plain
13 Washer, wheel
14 Bushing, tapered
15 Tube assembly
16 Tube assembly
17 Fitting, brake
18 Elbow, fitting
19 Adapter, wheel
20 Gasket, adapter
21 Adapter, bleeder
22 Fitting, bleeder
23 Fitting, bleeder
24 Washer, fitting
25 Nut, jam
26 Plug, pipe
27 Spring, return
28 Spring
29 Brake shoe
30 Retainer, brake
31 Washer, flat
32 Spring, helical
33 Pin, antirattle
34 Rod, push, wheel
35 Screw, cap
36 Washer, lock
37 Boot, dust
38 Piston, wheel
39 Cup, hydraulic
40 Spring, helical
41 Body, cylinder
42 Spacer, wheel cylinder
43 Backing plate
44 Screw, cap
45 Screw, cap
46 Washer, lock
47 Stud, plain
48 Dowel
49 Screw, cap
50 Washer, lock

Key to figure 7-35 (cont)

51 Stud, plain
52 Cap, grease
53 Pin, cotter
54 Nut, slotted
55 Washer, flat
56 Cone and roller
57 Cup, tapered
58 Case, gear
59 Seal, plain
60 Gear, final
61 Cup, tapered
62 Cone and roller
63 Spindle, wheel
4 Nut, plain
5 Washer, lock
6 Gasket, wheel
7 Collar, axle
8 Bearing, ball
9 Shaft, axle
0 Nut, plain
Washer, lock
Dowel, axle

73 Stud, plain
74 Washer, axle
75 Cone and rollers
76 Stud, plain
77 Stud, plain
78 Housing and cup
79 Housing and cup
80 Cup, tapered
81 Gasket, axle
82 Gasket, axle
83 Plug, pipe
84 Plug, pipe
85 Gear, bevel
86 Rivet, solid
87 Differential case
88 Screw, cap
89 Gear, bevel
90 Washer, thrust
91 Washer, spring
92 Gear, pinion
93 Spider
94 Housing

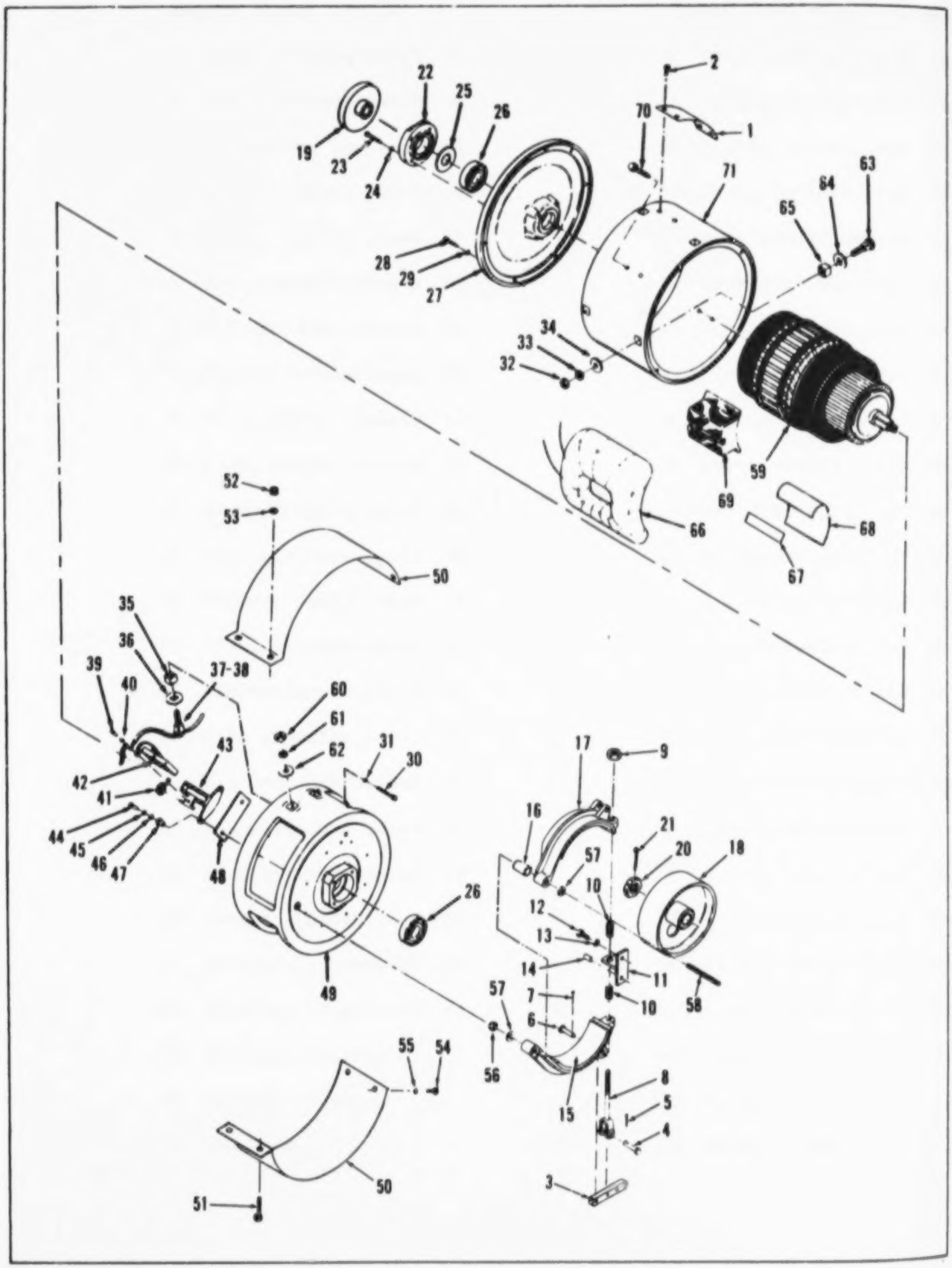
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Figure 7-36. Motor Drive Assembly

Key to figure 7-36

1 Plate, identification

2 Screw, drive

3 Link, brake

4 Pin, straight

5 Pin, cotter

6 Pin, straight

7 Pin, cotter

8 Rod, brake shoe

9 Nut, self-locking, hex

10 Spring, compression

11 Seat, spring

12 Screw, cap

13 Washer, lock

14 Pin, groove

15 Lining, friction

16 Bushing, sleeve

17 Brake shoe

18 Brake drum

19 Coupling, motor to adapter

20 Nut, slotted

21 Pin, cotter

22 Retainer, bearing

23 Screw, cap

24 Washer, lock

25 Washer, flat

26 Bearing, ball

27 Yoke, rear

28 Screw, cap

29 Washer, lock

30 Screw, cap

31 Washer, lock

32 Nut, plain

33 Washer, flat

34 Washer, insulating

35 Washer, sleeve

36 Washer, insulating

37 Connector, brush

38 Connector, brush

39 Screw, machine

40 Washer, lock

41 Spring, helical

42 Brush, electrical

43 Brush holder

44 Screw, machine

45 Washer, lock

46 Washer, flat

47 Bushing, insulating

48 Insulator

49 Yoke, motor

50 Cover

Figure 7-36 (cont)

51	Screw, cap
52	Nut, plain
53	Washer, lock
54	Screw, machine
55	Washer, lock
56	Nut, self-locking
57	Washer, flat
58	Stud, brake shoe
59	Armature, motor
60	Nut, plain
61	Washer, flat
62	Washer, insulator
63	Terminal motor
64	Washer, insulator
65	Bushing, insulating
66	Coil, field
67	Insulation, pole
68	Insulator, pole
69	Pole piece, magnet
70	Screw, cap
71	Frame, field

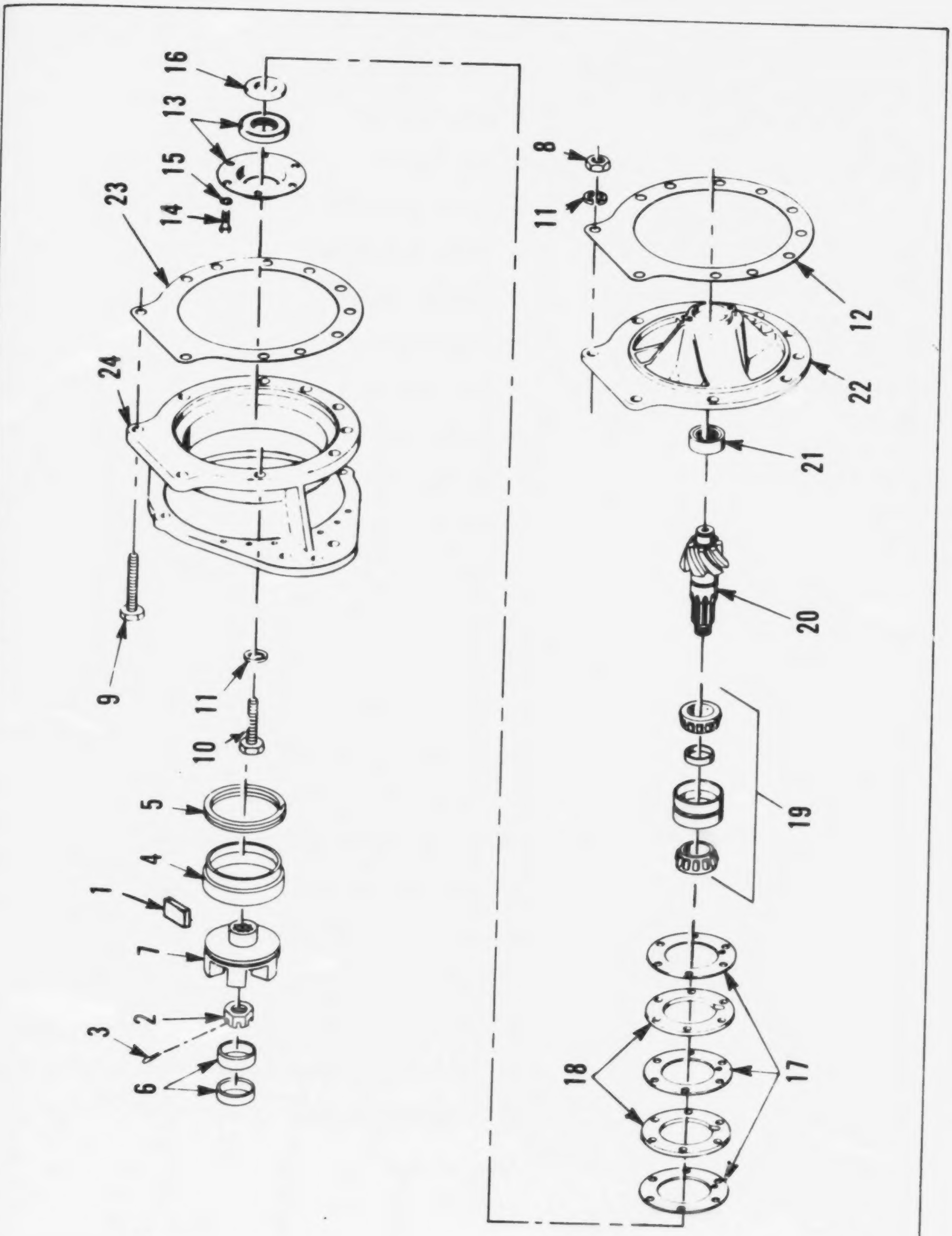

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Figure 7-37. Adapter Arrangement

Key to figure 7-37

1	Cushion, load
2	Nut, slotted
3	Pin, cotter
4	Collar, outside
5	Ring, retaining
6	Sleeve, inside
7	Coupling half
8	Nut, plain
9	Screw, cap
10	Screw, cap
11	Washer, lock
12	Gasket, cage to differential
13	Cap, oil seal retainer
14	Screw, cap
15	Washer, lock
16	Washer, thrust gearshaft
17	Gasket, oil seal retainer
18	Spacer, gearshaft bearing cap
19	Bearing, roller
20	Gearshaft, helical
21	Bearing, roller
22	Cage, gearshaft
23	Gasket, housing to cage
24	Housing, adapter

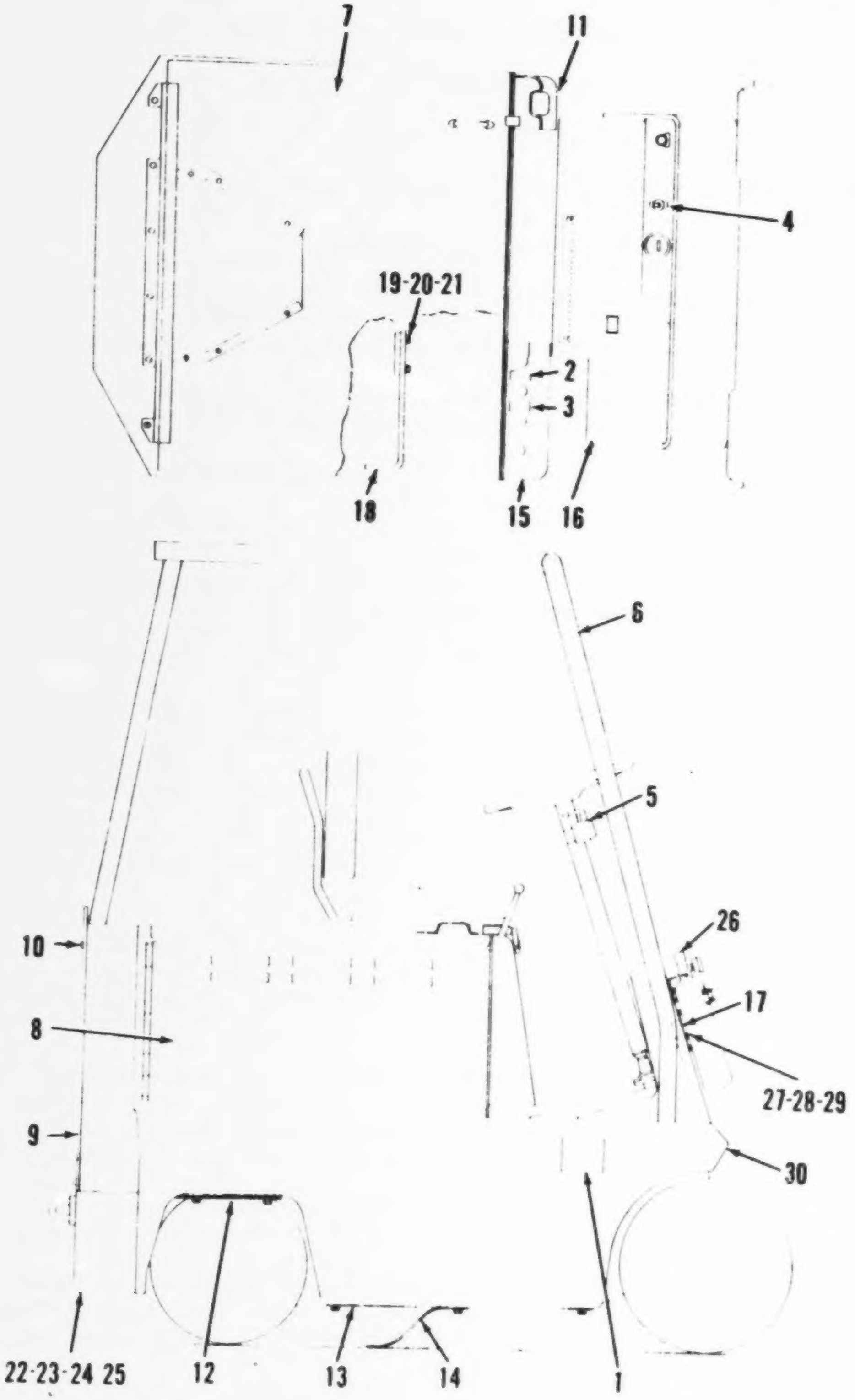
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Figure 7-38. Body and Chassis Arrangement

Key to figure 7-38

1 Plate, identification
2 Plate designation, hoist
3 Plate designation, tilt
4 Plate designation, lights
5 Plate designation, direction
6 Overhead guard
7 Cover, battery compartment
8 Cover, battery
9 Cover, fuse
10 Cover, scr
11 Cover, battery connector
12 Cover, wiring harness
13 Cover, travel motor
14 Strap, static drag
15 Cover, hydraulic control valve
16 Floor plate
17 Cover, front
18 Angle, battery holder
19 Screw, cap
20 Washer, lock
21 Washer, flat
22 Bolt, machine
23 Washer, flat
24 Washer, lock
25 Nut, plain, hex
26 Extinguisher, fire
27 Screw, machine
28 Nut, plain, hex
29 Washer, lock
30 Frame assembly

APPENDIX A

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

A-1. General

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance levels.

b. Section II designates overall responsibility for the performance of maintenance functions on the identified end item or component. The implementation of the maintenance functions upon the end item or component will be consistent with the assigned maintenance functions.

c. Section III contains supplemental instructions, explanatory notes and/or illustrations required for a particular maintenance function.

d. Section IV is not applicable.

A-2. Explanation of Columns in Section II

a. Group Number. Column 1. The assembly group is a numerical group assigned to each assembly in a top down breakdown sequence. The applicable assembly groups are listed on the MAC in disassembly sequence beginning with the first assembly removed in a top down disassembly sequence.

b. Assembly Group. Column 2. This column contains a brief description of the components of each assembly group.

c. Maintenance Functions. Column 3. This column lists the various maintenance functions (A through K) and indicates the lowest maintenance category authorized to perform these functions. The symbol designations for the various maintenance categories are as follows:

C - Operator or crew
O - Organizational maintenance
F - Direct support maintenance
H - General support maintenance
D - Depot maintenance

The maintenance functions are defined as follows:

A - INSPECT. To determine serviceability of an item by comparing its physical, mechanical, and electrical characteristics with established standards.

B - TEST. To verify serviceability and to detect electrical or mechanical failure by use of test equipment.

C - SERVICE. To clean, to preserve, to charge, and to add fuel, lubricants, cooling agents, and air. If it is desired that elements, such as painting and lubricating, be defined separately, they may be so listed.

D - ADJUST. To rectify to the extent necessary to bring into proper operating range.

E - ALIGN. To adjust specified variable elements of an item to bring to optimum performance.

F - CALIBRATE. To determine the corrections to be made in the readings of instruments or test equipment used in precise measurement. Consists of the comparison of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared with the certified standard.

G - INSTALL. To set up for use in an operational environment such as an emplacement, site, or vehicle.

H - REPLACE. To replace unserviceable items with serviceable like items.

I - REPAIR. Those maintenance operations necessary to restore an item to serviceable condition through correction of material damage or a specific failure. Repair may be accomplished at each category of maintenance.

J - OVERHAUL. Normally, the highest degree of maintenance performed by the Army in order to minimize time work in process is consistent with quality and economy of operation. It consists of that maintenance necessary to restore an item to completely serviceable condition as prescribed by maintenance standards in technical publications for each item of equipment. Overhaul normally does not return an item to like new, zero mileage, or zero hour condition.

K - REBUILD. The highest degree of materiel maintenance. It consists of restoring equipment as nearly as possible to new condition in accordance with original manufacturing standards. Rebuild is performed only when required by operational considerations or other paramount factors and then only at the depot maintenance category. Rebuild reduces to zero the hours or miles the equipment, or component thereof, has been in use.

d. Tools and Equipment. Column 4. This column is not applicable.

e. Remarks. Column 5. This column is provided for referencing by code the remarks (Section III) pertinent to the maintenance functions.

A-3. Explanation of Columns in Section III

a. Reference Code. This column consists of two letters separated by a dash, both of which are references to Section II. The first letter references column 5 and the second letter references a maintenance function, column 3, A through K.

b. Remarks. This column lists information pertinent to the maintenance function being performed, as indicated on the MAC, Section II.

SECTION II - MAINTENANCE ALLOCATION CHART

(1) GROUP NO.	(2) ASSEMBLY GROUP	(3) MAINTENANCE FUNCTIONS											(4) TOOLS AND EQUIPMENT	(5) REMARKS
		A INSPECT	B TEST	C SERVICE	D ADJUST	E ALIGN	F CALIBRATE	G INSTALL	H REPLACE	I REPAIR	J OVERHAUL	K REBUILD		
01	ELECTRICAL SYSTEM													
	Hour meter	0							0					
	Switch, light	0							0					
	Switch, emergency stop	0							0					
	Switch, stoplight	0							0					
	Lights													
	Lamps	0							0					
	Lights Head, stop & tail	0							0					
	Resistors, lights		0						0					
	Horn													
	Button, horn								0	0				A
	Horn assembly		0						0					

SECTION II - MAINTENANCE ALLOCATION CHART

(1)	(2)	(3) MAINTENANCE FUNCTIONS											(4)	(5)
GROUP NO.	ASSEMBLY GROUP	A INSPECT	B TEST	C SERVICE	D ADJUST	E ALIGN	F CALIBRATE	G INSTALL	H REPLACE	I REPAIR	J OVERHAUL	K REBUILD	TOOLS AND EQUIPMENT	REMARKS
	Horn (Cont'd)													
	Horn wiring	0							0					
	Batteries													
	Receptacle, Charging	0							0	F				
	Battery, Storage	0	0	0					0			D		
	Cables, battery	0							0					
	Hull or chassis wiring													
	Harness, wiring	0							F	0				
02	FRONT AXLE													
	Front axle assembly													
	Axle assembly, driving	0		0					F	F	H			

(1)	(2)	(3) MAINTENANCE FUNCTIONS											(4)	(5)
GROUP NO.	ASSEMBLY GROUP	A	B	C	D	E	F	G	H	I	J	K	TOOLS AND EQUIPMENT	REMARKS
		INSPECT	TEST	SERVICE	ADJUST	ALIGN	CALIBRATE	INSTALL	REPLACE	REPAIR	OVERHAUL	REBUILD		
	FRONT AXLE (Cont'd)													
	Differential													
	Differential assembly	F		0					F	F	H			
03	REAR AXLE													
	Rear axle assembly													
	Axle assembly, steering	0			0				F	F				
	Steering													
	Arm, steering	0			F				F					
	Axle, steering								F					

SECTION II - MAINTENANCE ALLOCATION CHART

(1) GROUP NO.	(2) ASSEMBLY GROUP	(3) MAINTENANCE FUNCTIONS A INSPECT	B TEST	C SERVICE	D ADJUST	E ALIGN	F CALIBRATE	G INSTALL	H REPLACE	I REPAIR	J OVERHAUL	K REBUILD	(4) TOOLS AND EQUIPMENT	(5) REMARKS
04	BRAKES													
	Handbrakes													
	Brakeshoe assembly motor	O							F	F				
	Cable, handbrake	O		O	O				O					
	Control linkage				O				O					
	Drum, brake	O							F					
	Lever, handbrake								O					
	Service brakes													
	Brake assembly	O			O				F	F				
	Shoe assembly	O			O				O					

(1) GROUP NO.	(2) ASSEMBLY GROUP	(3) MAINTENANCE FUNCTIONS											(4) TOOLS AND EQUIPMENT	(5) REMARKS
		A INSPECT	B TEST	C SERVICE	D ADJUST	E ALIGN	F CALIBRATE	G INSTALL	H REPLACE	I REPAIR	J OVERHAUL	K REBUILD		
	BRAKES (Cont'd)													
	Hydraulic brake system													
	Master cylinder	0		0					0	F				B
	Tube assembly, metal	0							0					
	Wheel, cylinder	0							0	F				C
05	WHEELS													
	Wheels assembly													
	Bearing and seals, rear wheels	0		0	0				0					
	Wheel assembly								0					
	Tires													
	Tires, solid	0							F					

SECTION II - MAINTENANCE ALLOCATION CHART

(1) GROUP NO.	(2) ASSEMBLY GROUP	(3) MAINTENANCE FUNCTIONS											(4) TOOLS AND EQUIPMENT	(5) REMARKS
		A	B	C	D	E	F	G	H	I	J	K		
		INSPECT	TEST	SERVICE	ADJUST	ALIGN	CALIBRATE	INSTALL	REPLACE	REPAIR	OVERHAUL	REBUILD		
06	STEERING													
	Steering assembly													
	Bearing, bellcrank								F					
	Bellcrank								F					
	Drag, link			0	F				F					
	Rod assembly, tie				0				F					
	Steering gear assembly			0	0				F					
	Wheel, steering								0					
07	BODY, CAB, HOOD AND HULL													
	Body, cab, hood, hull assemblies													
	Covers (Battery compartment)								0					
	Overhead guard								0					

(1)	(2)	(3) MAINTENANCE FUNCTIONS											(4)	(5)
		A	B	C	D	E	F	G	H	I	J	K		
GROUP NO.	ASSEMBLY GROUP	INSPECT	TEST	SERVICE	ADJUST	ALIGN	CALIBRATE	INSTALL	REPLACE	REPAIR	OVERHAUL	REBUILD	TOOLS AND EQUIPMENT	REMARKS
	Body, cab, hood, hull assy (cont'd)													
	Floor													
	Plate, floor								0					
	Seats													
	Seat assembly	0							0	0				
08	HYDRAULIC LIFT COMPONENTS													
	Hydraulic pump													
	Pump, rotary, power driven hydraulic	0							F	F				
	Hydraulic control valve													
	Valve, directional control	0							F	F				
	Hydraulic control levers and linkage													

SECTION II - MAINTENANCE ALLOCATION CHART

(1) GROUP NO.	(2) ASSEMBLY GROUP	(3) MAINTENANCE FUNCTIONS A INSPECT	B TEST	C SERVICE	D ADJUST	E ALIGN	F CALIBRATE	G INSTALL	H REPLACE	I REPAIR	J OVERHAUL	K REBUILD	(4) TOOLS AND EQUIPMENT	(5) REMARKS
	Hydraulic control levers and linkage (Cont'd)													
	Bracket, control valve								O					
	Levers, control								O					
	Hydraulic tilt cylinders													
	Cylinder assembly, tilt	O							O	F				
	Hydraulic mast column													
	Chain assembly	O		O	O				O	O				
	Crosshead								F	F				
	Cylinder assembly, actuating, hoist	O							F	F				
	Forks								O					
	Roller assembly								F					
	Upright assembly	O		O	O				F	H	H			

(1) GROUP NO.	(2) ASSEMBLY GROUP	(3) MAINTENANCE FUNCTIONS A INSPECT	B TEST	C SERVICE	D ADJUST	E ALIGN	F CALIBRATE	G INSTALL	H REPLACE	I REPAIR	J OVERHAUL	K REBUILD	(4) TOOLS AND EQUIPMENT	(5) REMARKS
	Hydraulic lines and fittings													
	Cap, oil breather	0		0					0					
	Filter element	0							0					
	Hoses assembly, rubber	0							0	0				
	Tank, oil	0		0					F					
	Valve, regulating								0					
09	ELECTRIC MOTORS													
	Motor assembly													
	Motor assembly, travel	F	F						F	F	H			
	Motor assembly, pump	F	F						F	F	H			
	Motor assembly, steering	F	F						F	F	H			
	Brush holders													
	Brush, electrical contact	0							F					

SECTION II - MAINTENANCE ALLOCATION CHART

(1)	(2)	(3) MAINTENANCE FUNCTIONS											(4)	(5)
GROUP NO.	ASSEMBLY GROUP	A INSPECT	B TEST	C SERVICE	D ADJUST	E ALIGN	F CALIBRATE	G INSTALL	H REPLACE	I REPAIR	J OVERHAUL	K REBUILD	TOOLS AND EQUIPMENT	REMARKS
	Brush holders (cont'd)													
	Holder, electrical contact brush	F							F					
	Endbell	F							F					
	Frame supports and housings													
	Bearing, ball annular, drive motors	F							F					
10	DRIVE COMPONENTS													
	Adapter assembly, gear reduction	0		0					F	F				
	Accelerator control assembly													
	Potentiometer	F							F					
	Control, accelerator	0							F	F				
	Switch, sensitive								F					

(1) GROUP NO.	(2) ASSEMBLY GROUP	(3) MAINTENANCE FUNCTIONS											(4) TOOLS AND EQUIPMENT	(5) REMARKS
		A INSPECT	B TEST	C SERVICE	D ADJUST	E ALIGN	F CALIBRATE	G INSTALL	H REPLACE	I REPAIR	J OVERHAUL	K REBUILD		
	Accelerator control assembly (Cont'd)													
	Contacts electrical	0							F					
	Contacts stationary	0							F					
	Contacts finger	0							F					
11	FUSE AND CIRCUIT BREAKER													
	Fuse, cartridge	0							0					
	Fuse holder								F					
	Link, fuse								F					
	Oscillator module	F	F						F					
12	SWITCHES													
	Lever, switch								F					
	Switch, directional control	0							F	F				

SECTION II - MAINTENANCE ALLOCATION CHART

(1) GROUP NO.	(2) ASSEMBLY GROUP	(3) MAINTENANCE FUNCTIONS A INSPECT	B TEST	C SERVICE	D ADJUST	E ALIGN	F CALIBRATE	G INSTALL	H REPLACE	I REPAIR	J OVERHAUL	K REBUILD	(4) TOOLS AND EQUIPMENT	(5) REMARKS
	Resistor													
	Resistor, fixed		0						0					
	Relay													
	Relay, armature	0	F						F	F				
	Contact, relay	0							0					
	Relay, thermal	0	0						0					
	Rectifier, transformer													
	SCR assembly	F	F						F					
	Radio interference suppression													
	Strap, static drag								F					

MAINTENANCE ALLOCATION CHART

REFERENCE CODE	REMARKS
A - I	Repair includes installing repair kit.
B - I	Repair includes installing repair kit.
C - I	Repair includes installing repair kit.

APPENDIX B

BASIC ISSUE ITEMS LIST

Section I. INTRODUCTION

B-1. Scope

This appendix lists items which accompany the Fork Lift Truck or are required for installation, operation, or operator's maintenance.

B-2. General

This Basic Issue Items List is divided into the following sections:

a. Basic Issue Items - Section II. A list of items which accompany the Fork Lift Truck and are required by the operator/crew for installation, operation, or maintenance.

b. Maintenance and Operating Supplies - Section III. A listing of maintenance and operating supplies required for initial operation.

B-3. Explanation of Columns

The following provides an explanation of columns in the tabular list of Basic Issue Items, Section II.

a. Source, Maintenance, and Recoverability Codes (SMR).

(1) Source code, indicates the source for the listed item. Source codes are:

Code	Explanation
P	Repair parts which are stocked in or supplied from the GSA/DSA or Army supply system and authorized for use at indicated maintenance categories.
M	Repair parts which are not procured or stocked, but are to be manufactured in indicated maintenance levels.
A	Assemblies which are not procured or stocked as such, but are made up of two or more units. Such component units carry individual stock numbers and descriptions, are procured and stocked separately and can be assembled to form the required assembly at indicated maintenance categories.
X	Parts and assemblies which are not procured or stocked and the mortality of which normally is below that of the applicable end item or component. The failure of such part or assembly should result in retirement of the end item from the supply system.

Code	Explanation
X1	Repair parts which are not procured or stocked. The requirement for such items will be filled by use of the next higher assembly or component.
X2	Repair parts which are not stocked. The indicated maintenance category requiring such repair parts will attempt to obtain them through cannibalization, requirements will be requisitioned, with accompanying justification, through normal supply channels.
G	Major assemblies that are procured with PEMA funds for initial issue only as exchange assemblies at DSU and GSU level. These assemblies will not be stocked above GS and DS level or returned to depot supply level.

(2) Maintenance code, indicates the lowest category of maintenance authorized to install the listed item. The maintenance level code is:

Code	Explanation
C	Operator/crew

(3) Recoverability code, indicates whether unserviceable items should be returned for recovery or salvage. Items not coded are expendable. Recoverability codes are:

Code	Explanation
R	Repair parts (assemblies and components) which are considered economically reparable at direct and general support maintenance levels. When the maintenance capability to repair these items does not exist, they are normally disposed of at the GS level. When supply considerations dictate, some of these repair parts may be listed for automatic return to supply for depot level repair as set forth in AR 710-50. When so listed, they will be replaced by supply on an exchange basis.
S	Repair parts and assemblies which are economically reparable at DSU and GSU activities and which normally are furnished by supply on an exchange basis. When items are determined by a GSU to be uneconomically reparable they will be evacuated to a depot for evaluation and analysis before final disposition.
T	High dollar value recoverable repair parts which are subject to special handling and are issued on an exchange basis. Such repair parts normally are repaired or overhauled at depot maintenance activities.
U	Repair parts specifically selected for salvage by reclamation units because of precious metal content, critical materials, or high dollar value reusable casings or castings.

b. Federal Stock Number. This column indicates the Federal stock number assigned to the item and will be used for requisitioning purposes.

c. Description. This column indicates the Federal item name and any additional description of the item required.

d. Unit of Measure (U/M). A 2 character alphabetic abbreviation indicating the amount or quantity of the item upon which the allowances are based, e.g., ft, ea, pr, etc.

e. Quantity Incorporated in Unit. This column indicates the quantity of the item used in the assembly group.

f. Quantity Furnished With Equipment. This column indicates the quantity of an item furnished with the equipment.

g. Illustration. This column is not applicable.

B-4. Explanation of Columns in the Tabular List of Maintenance and Operating Supplies - Section III.

a. Component Application. This column identifies the component application of each maintenance or operating supply item.

b. Federal Stock Number. This column indicates the Federal stock number assigned to the item and will be used for requisitioning purposes.

c. Description. This column indicates the item name and brief description.

d. Quantity Required for Initial Operation. This column indicates the quantity of each maintenance or operating supply item required for initial operation of the equipment.

e. Quantity Required for 8 Hours Operation. This column indicates the estimated quantities required for an average 8 hours of operation.

f. Notes. This column indicates informative notes keyed to data appearing in a preceding column.

SECTION II. BASIC ISSUE ITEMS

(1) SMR CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION	(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) QTY FURN WITH EQUIP	(7) ILLUSTRATION (A) FIG NO.	(7) ILLUSTRATION (B) ITEM NO.
PC		ARMY LUBRICATION ORDER LO 10-3930-615-12	EA	1	1		
PC		ARMY TECHNICAL ORDER TM 10-3930-615-15	EA	1	1		
PC	7510-889-3494	BINDER, Looseleaf	EA	1	1		
PC	7520-559-9618	CASE, Operator and maintenance publications	EA	1	1		
PC	4210-889-2221	EXTINGUISHER, Fire	EA	1	1		

SECTION III. MAINTENANCE AND OPERATING SUPPLIES

(1) COMPONENT APPLICATION	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION	(4) QUANTITY REQUIRED F/ INITIAL OPERATION	(5) QUANTITY REQUIRED F/8 HRS OPERATION	(6) NOTES
BRAKE MASTER CYLINDER		BRAKE FLUID, AUTOMOTIVE: gal can as follows:			(1) See C9100-IL for additional data and requisitioning procedure. (2) See current LO for grade, application and replenishment intervals.
	9150-231-9071 (1)	HB	1 pt	(2)	
DIFFERENTIAL DRIVE AXLE		LUBRICATING OIL, GEAR: 5 gal drum as follows:			
	9150-577-5844 (1)	GO-90	1 qt	(2)	
	9150-257-5440 (1)	GOS	20 qt	(2)	
HYDRAULIC SYSTEM		OIL, LUBRICATING: 5 gal pails as follows:			
	9150-265-9428 (1)	OE-10	1 qt	(2)	
	9150-242-7603 (1)	OES	20 qts	(2)	
LUBRICATION FITTINGS		GREASE, AUTOMOTIVE AND ARTILLERY: 1 lb can as follows:			
	9150-190-0904 (1)	GAA	1 lb	(2)	

By Order of the Secretary of the Army:

W. C. WESTMORELAND,
General, United States Army,
Chief of Staff.

Official:

KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

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